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RESULTS

OF THE

MAGNETICAL AND METEOROLOGICAL OBSERVATIONS

MADE AT

THE ROYAL OBSERVATORY, GREENWICH,

IN THE YEAR

1877:

UNDER THE DIRECTION OF

SIR GEORGE BIDDELL AIRY, K.C.B. M.A. LL.D. D.C.L.,

ASTRONOMER ROYAL.

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1879.

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ROYAL OBSERVATORY, GREENWICH.

RESULTS

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MAGNETICAL AND METEOROLOGICAL OBSERVATIONS.

1877.

GREENWICH MAGNETICAL AND METEOROLOGICAL OBSERVATIONS, 1877.

Introduction.

§ I. *Buildings of the Magnetic Observatory.*

In consequence of a representation by the Astronomer Royal, dated 1836, January 12, and a memorial by the Board of Visitors of the Royal Observatory, dated 1836, February 26, addressed to the Lords Commissioners of the Admiralty, an additional space of ground on the south-east side of the former boundary of the Observatory grounds was inclosed from Greenwich Park for the site of a Magnetic Observatory, in the summer of 1837; and the Magnetic Observatory was erected in the spring of 1838. Its nearest angle in its present form is about 174 feet from the nearest point of the S.E. dome, and about 30 feet from the office of Clerk of Works. It is based on concrete and built of wood, united for the most part by pegs of bamboo; no iron was intentionally admitted in its construction, or in subsequent alterations. Its form, as originally built, was that of a cross with four equal arms, very nearly in the direction of the cardinal magnetic points as they were in 1838; the length within the walls, from the extremity of one arm of the cross to the extremity of the opposite arm, was 40 feet, the breadth of each arm 12 feet. In the spring of 1862, the northern arm was extended 8 feet. The height of the walls inside is 10 feet, and the ceiling of the room is about 2 feet higher. The northern arm of the cross is separated from the central square by a partition, so as to form an ante-room, which is occupied by computers of the Magnetical and Meteorological Department. The meridional magnet for observations of absolute declination, formerly used also for observations of variations of declination, (placed in its position in 1838), is mounted in the southern arm; and the theodolite by which the magnet-collimator is viewed, and by which circumpolar stars for determination of the astronomical meridian are also observed, (for which observation an opening is made in the roof, with proper shutters,) is in the southern arm, near the southern boundary of the central square. The bifilar magnet, for variations of horizontal magnetic force (erected at the end of 1840), was mounted near the northern wall of the eastern-arm; and the balance-magnetometer, for variations of vertical magnetic force (erected in

1841) was mounted near the northern wall of the western arm. Important changes have subsequently been made in the positions of these instruments, as will be mentioned below. The sidereal-time-clock is in the south arm, near the south-east re-entering angle. The fire-grate (constructed of copper, as far as possible,) is near the north end of the west side of the ante-room. Some of these fixtures may contain trifling quantities of iron; and, as the ante-room is used as a computing room, it is impossible to avoid the introduction of iron in small quantities; great care, however, is taken to avoid it as far as possible.

In 1864, a room, called the Magnetic Basement, was excavated below the whole of the Magnetic Observatory except the ante-room; the descent to it is by a staircase close to the south wall of the western arm of the building.

For the theodolite, a brick pier was built from the ground below the floor of the Basement, rising through the ceiling into the south arm of the upper room, and supporting the theodolite in exactly the same position as before.

Instead of a single meridional magnet performing the double functions of "magnet for determining absolute magnetic declination," and "magnet carrying a mirror for photographic register," there are now two meridional magnets, one in the Upper Room and one in the Basement. The upper (original) magnet is in a position about 10 inches north of its former position; it carries a collimator, for observation by the theodolite; but, in reversion of position of the collimator, the collimator is always either above or below the magnet, so that the magnet is always in the same vertical. The lower magnet, procured in the year 1864, is in nearly the same vertical with the upper magnet; it carries the mirror for the photographic register of the continual changes of declination. A massive brick pier is built in the south arm of the Basement, covered by a stone slab; upon it is fixed the gun-metal stand carrying the photographic lamp, and the slit through which it shines; from the stone slab rise three smaller piers, upon which crossed slates are placed; and from these rises a small pier through the ceiling, to the height of 18 inches above the upper floor, carrying the suspension pulleys of the lower magnet; the skein of silk, which supports the lower magnet, passes through a hole in one of the slates. Upon the slates on the brick piers rest the feet of the original wooden stand carrying the suspension of the upper magnet. As, from time to time, the wooden stand has been shifted slightly to the west, with change of the magnetic meridian, its western support had, in course of time, reached such a position that it became necessary in 1876 to place, on the top of the original slate, another, bound by brass cramps to the brick pier, but projecting further west. On this the support of the wooden stand now rests.

The bifilar-magnetometer is in the Basement, in a position vertically below its former position. A massive brick pier, surmounted by a thick slab of stone (upon which the metal stand carrying the photograph lamp and slit is fixed) supports a pier consisting of a back and return-sides, which rises through the ceiling

about 2 feet above the upper floor, and is crowned by a slate slab that carries the suspension of the bifilar-magnetometer.

The vertical-force magnetometer is in the Basement, in a position vertically below its former position; it rests upon a brick pier, capped by a thick stone; to which also is fixed the plate of metal with slit through which passes the light of the photographic lamp.

To the lower part of the theodolite-pier, within the Basement, are fixed telescopes for eye-observation of the bifilar and vertical-force magnetometers. They are protected from accidental violence by guards fixed to the floor, first attached on 1871, May 2.

At the south-east re-entering angle of the Basement (which has been rebated for the purpose) is the horizontal photographic cylinder, which receives the traces of the movements of the declination-magnet and the bifilar-magnet. The angle is so far cut away that the straight line joining their suspensions passes at the distance of one foot from the wall, and thus the cylinder receives the light from the concave mirrors carried by both instruments, at right angles to its surface. The vertical cylinder which receives the traces of the movements of the vertical-force-magnet, and of the self-registering barometer near it, is east of the vertical force pier.

In the south-east corner of the eastern arm is placed the apparatus for self-registration of the spontaneous galvanic currents on the wires leading respectively from Angerstein Wharf to Lady Well Station (on the Mid Kent Railway), and from North Kent Junction (on the Greenwich Railway) to Morden College end of the Blackheath Tunnel (on the North Kent Railway). The straight lines connecting these points intersect each other nearly at right angles, at a point not far distant from the Observatory (see § 12 below).

The mean-time-clock is on the west wall of the south arm of the Basement.

Adjoining the north wall is the table for photographic operations. Much water is used in these operations, and therefore a pump is provided in the grounds at a distance of about 30 feet from the nearest magnetometer, by which the water is withdrawn from the cistern at the east end of the photographic table and at once discharged into a coverèd drain.

Near the west end of the photographic table and fixed to the north wall is the Sidereal Standard Clock of the Astronomical Observatory, Dent 1906, communicating with the Chronograph and other clocks in the Astronomical Department by galvanic wires. It was established in this position at the end of May 1871.

The Basement is warmed by a gas-stove, and ventilated by a large copper tube nearly two feet in diameter, receiving the flues from the stove and all the lamps, and passing through the upper room to a revolving cowl above the roof. Each of the arms of the basement has a window facing the south, but in general the window-wells are closely stopped.

The variations in the temperature of the instruments have been greatly reduced by their location within this Basement.

On the outside of the Magnetic Observatory, near the north-east corner of the ante-room, a pole 79 feet in height is fixed, for the support of the conducting wire to the electrometers; the electrometers, &c., are planted in the window-seat at the north-end of the ante-room.

The apparatus for naphthalizing the gas used in the photographic registration is mounted in a small detached zinc-built room, erected in 1863, near the west side of the ante-room. The use of the naphthalizing process, which had been discontinued in the years 1865 to 1870, has since 1871 been resumed.

In 1863, a range of seven rooms, usually called the Magnetic Offices, was erected near the southern fence of the grounds, as it existed at that time; an addition, however, was made to the grounds in 1868, carrying the fence 100 feet further south. Since the summer of 1863, observations of Dip and Deflexion have been made in the westernmost of these rooms, No. 7. On 1871, December 1, the Watchman's Clock was moved from the Quadrant Passage of the Astronomical Observatory to Magnetic Office No. 3, and on 1872, November 14, it was again moved from Office No. 3 to No. 1. Nos. 2, 3, and 4 are now used as Photographic Offices in connection with the Photoheliograph placed in a dome adjoining No. 3 on the south side.

At the distance of 28 feet south (magnetic) from the south-east angle of the southern arm is an open shed about $10^{ft}\ 6^{in}$ square, supported by four posts at the height of 8 feet, with an adjustible opening at the center of the roof. Under this shed are placed the large dry-bulb and wet-bulb thermometers, with a photographic cylinder, whose axis is vertical, between them; and external to these are the gas flames, whose light passing through the thermometer-tubes above the quicksilver makes photographic traces upon the paper which covers the cylinder.

For better understanding of these descriptions, the reader is referred to the Descriptions of Buildings and Grounds with accompanying Maps, attached to the Volumes of Astronomical Observations for the years 1845 and 1862.

§ 2. *Upper Declination-Magnet and Apparatus for observing it.*

The theodolite, with which the meridional magnet is observed, is by Simms: the radius of its horizontal circle is 8·3 inches: it is divided to 5′; and is read to 5″, by three verniers, carried by the revolving frame of the theodolite. The fixed frame stands upon three foot-screws, which rest in brass channels let into the stone pier that stands upon the brick pier rising from the ground of the Magnetic Basement. The revolving frame carries the Y's (with vertical adjustment at one end) for a telescope with transit-axis: the length of the axis is $10\frac{1}{2}$ inches: the length of the telescope 21 inches: the aperture of the object glass 2 inches. The Y's are not

carried immediately by the T head which crosses the vertical axis of the revolving frame, but by pieces supported by the ends of that T head, and projecting horizontally from it: the use of this construction is to allow the telescope to be pointed sufficiently high to see δ Ursæ Minoris above the pole. The eye-piece of the telescope carries only one fixed horizontal wire, and one vertical wire moved by a micrometer-screw. The opening in the roof of the building permits the observation of circumpolar stars, as high as δ Ursæ Minoris above the pole, and as low as β Cephei below the pole.

For supporting the magnet, a braced wooden tripod-stand is provided, whose feet, as above described, rest upon slates covering brick piers in the Magnetic Basement. Upon the cross-bars of the stand rests a double rectangular box (one box completely inclosed within another), both boxes being covered with gilt paper on their exterior and interior sides. On the southern side of the principal upright piece of the stand is a moveable upright bar, turning in the vertical E. and W. plane, upon a pin in its center (which is fixed in the principal upright), and carrying at its top a brass frame supporting two pulleys for suspension of the magnet; this construction is adopted as convenient for giving an E. and W. movement (now very rarely required) to the point of suspension, by giving a motion to the lower end of the bar. The pulleys, whose axes are E. and W., project one on the north side of the moveable upright, the other on the south side, and are adapted to carry a flat leather strap. Formerly this strap was attached directly to the suspension skein, but at the beginning of the present year this manner of attachment was changed. The end of the strap depending from the north pulley is now connected to a square wooden rod sliding in the corresponding squared hole of a fixed wooden bracket. The suspension skein is attached to the lower end of the wooden rod, so that in raising or lowering the magnet carrier (necessary in some operations) no alteration is made in the free length of the suspension skein. The strap passes from the north pulley over the south pulley, and thence downwards to a small windlass, fixed to the lower part of the moveable upright. The height of the two pulleys above the floor is about 11 ft. 4 in., and the height of the magnet is about 2 ft. 11 in.; the length of the rod, carrying at its upper end the torsion circle, and at its lower end the cradle supporting the magnet, is 1 ft. 4 in.; and the length of strap and rod below the north pulley is about 1 ft. 3 in.; so that the length of the free suspending skein is about 5 feet 10 inches.

The magnet was made by Meyerstein, of Göttingen: it is a bar 2 feet long, $1\frac{1}{2}$ inch broad, and about $\frac{1}{4}$ inch thick: it is of hard steel throughout. The magnet-carrier was also made by Meyerstein, but it has since been altered by Simms. The magnet is inserted sideways and fixed by a screw in the double square hook which constitutes the lower part of the magnet-carrier. This lower part turns stiffly on a vertical axis, independently of the upper part, and carries with it the graduated torsion circle:

to the upper part is fixed the vernier for reading the circle. The upper part of the magnet-carrier is simply hooked into the skein.

The suspending skein was originally of silk fibre, in the state in which it is first prepared by silk manufacturers for further operations; namely, when seven or more fibres from the cocoon are united by juxtaposition only (without twist) to form a single thread. The skein was strong enough to support perhaps three times the weight of the magnet, &c.

In the summer and autumn of 1864, an attempt was made to suspend the magnet by a steel wire, capable of supporting the weight 15 lbs.; but the torsion force was found to be so large as greatly to diminish the value of the observations; and the skein was finally restored on 1865, January 20. A similar attempt was made for suspension of the lower magnet; the skein, however, was restored on 1865, January 30.

Upon the upper magnet there slide two brass frames, firmly fixed in their places by means of pinching-screws. One of these contains, between two plane glasses, a cross of delicate cobwebs; the other holds a lens of 13 inches focal length and nearly 2 inches aperture. This combination, therefore, serves as a reversed telescope without a tube: the cross of cobwebs is seen very well with the theodolite-telescope, when the suspension-bar of the magnet is so adjusted as to place the object-glass of the reversed telescope in front of the object-glass of the theodolite, their axes coinciding. The wires are illuminated by a lamp and lens at night, and by a reflector during the day.

In the original mounting of this magnet the small vibrations were annihilated by a copper oval or "damper," thus constructed: A copper bar, about one inch square, is bent into a long oval form, intended to encircle the magnet (the plane of the oval curve being vertical). A lateral bend is made in the upper half of the oval, to avoid interference with the suspension-piece of the magnet. The effect of this damper was, that after every complete or double vibration of the magnet, the amplitude of the oscillation is reduced in the proportion of 5 : 2 nearly.

On mounting the photographic magnetometer in the basement, the damper was removed from its place surrounding the upper magnet, and was adjusted to encircle the photographic magnet. The upper magnet remained unchecked in its vibrations till 1866, January 23, when the lower part of its carrier was connected with a brass bar which vibrates in water.

OBSERVATIONS RELATING TO THE PERMANENT ADJUSTMENTS OF THE UPPER DECLINATION-MAGNET AND ITS THEODOLITE.

1. Determination of the inequality of the pivots of the theodolite-telescope.

1875, August 31. The theodolite was clamped, so that the transit-axis was at right angles to the meridian. The illuminated end of the axis of the telescope was

first placed to the East: the level was applied, and its scale was read; the level was then reversed, and its scale was again read; it was then again reversed, and again read, and so on successively six times. The illuminated end of the axis was then placed to the West, and the level was applied and read as before. This process was repeated several times, and the result was, that when the level indicates the axis to be horizontal, the pivot at the illuminated end is really too low by 1″·5. Other determinations made 1875, September 21, and 1876, December 1, gave respectively 1″·3 and 1″·1. The value applied during the year 1877 to the mean level reading is $1^{\text{div}}{\cdot}3$ as before, equivalent to 1″·4.

2. Value of one revolution of the micrometer-screw of the theodolite-telescope.

On 1870, December 29, the magnet was made to rest on blocks of wood, and its collimator was used as a fixed mark at an infinite distance. The micrometer of the theodolite-telescope was placed in different positions, and the vertical frame carrying the telescope was then turned till the micrometer wire bisected the cross. The result of several comparisons of theodolite-readings with large values and with small values of the micrometer-reading was, that one revolution = 1′. 34″·2. Similar experiments made 1875, September 1, and December 28, gave respectively 1′. 34″·1, and 1′. 34″·2. The value used throughout the year 1877 is 1′. 34″·2.

3. Determination of the micrometer-reading for the line of collimation of the theodolite-telescope.

1877, January 3. The vertical axis of the theodolite had been adjusted to verticality, and the transit-axis was made horizontal. The declination-magnet was made to rest on blocks, and the cross-wires carried by it were used as a collimator for determining the line of collimation of the telescope of the theodolite. The telescope was reversed after each observation. The mean of 10 double observations was $100^{\text{r}}{\cdot}064$. On 1877, December 18, the mean of 20 double measures gave $100^{\text{r}}{\cdot}108$. The value $100^{\text{r}}{\cdot}064$ was used throughout the year.

4. Determination of the effect of the mean-time-clock on the declination-magnet.

The observations by which this has been determined are detailed in the volumes for 1840, 1841, 1844, and 1845. It appeared that it was necessary to add 9″·41 to every reading of the theodolite. The clock was removed to the basement in 1864, having now nearly the same relative position to the lower declination-magnet which formerly it had to the upper. No correction is now applied to the upper declination-magnet.

5. Determination of the compound effects of the vertical-force-magnet and the horizontal-force-magnet on the declination-magnet.

The details applying to the effect of the horizontal-force-magnet and first vertical-force-magnet will be found in the volumes for 1840, 1841, 1844, and 1845. It

appeared that it was necessary to subtract 55″·22 from all readings of the theodolite. In 1848 a new vertical-force-magnet was introduced, and the subtractive quantity was then found to be 42″·2. A few experiments made on 1864, May 26, after removal of the horizontal and vertical force magnets to the basement, seemed to show that the theodolite readings required a subtractive correction of 36″·9, but no numerical correction has since been applied.

6. Determination of the error of collimation for the plane glass in front of the boxes of the declination-magnet.

1875, December 28. The magnet was made to rest on blocks. The micrometer head of the telescope was to the East. The plane glass has the word "top" engraved on it, and, in ordinary use, this word is always kept east. The cross-wire carried by the collimator of the magnet was observed with the engraved word alternately east and west. The result of 20 double observations was, that in the ordinary position of the glass 17″·3 is to be added to all readings. On 1877, December 18, 10 double observations gave 14″·9. The value used during the year 1877 was 16″·1.

7. Determination of the error of collimation of the magnet-collimator, with reference to the magnetic axis of the magnet.

1877, January 10. Observations were made by placing the declination-magnet in its stirrup, with its collimator alternately above and below, and observing the collimator-wire by the theodolite-telescope; the windlass of the suspending skein being so moved that the collimator in each observation was in the line of the theodolite-telescope. The observation was repeated several times. The mean half excess of reading with collimator above (its usual position), over that with collimator below, was 26′. 9″·4. Observations made 1877, December 18, gave 26′. 42″·5. The mean of these values, or 26′. 26″·0, has been used during the year 1877.

8. Effect of the damper.

In the volume for 1841 observations are exhibited shewing that the oval copper bar, or damper, which then surrounded what is now the upper declination-magnet, had but little or no effect. Repeated observations, of less formal character, in succeeding years, have confirmed this result. The same bar has encircled the lower declination-magnet since the year 1865. The following observations were made in the year 1865, for ascertaining the effect of the damper on the lower declination-magnet under various circumstances.

On 1865, February 8 and 10, and March 2, the time of vibration of the magnet was observed:—

Mean of times with damper in usual position	23ˢ·888
Mean of times with damper reversed end for end	24ˢ·508
Mean of times when damper was removed	23ˢ·153

These seem to indicate a repulsion of the magnet by the damper, but the magnet came to rest so rapidly that the observations are very uncertain.

On several days from 1865, April 2 to May 12, observations were made for ascertaining the deflection of the magnet produced by turning the damper through a small angle round a vertical axis, passing through its center.

DAMPER IN USUAL POSITION.

					′ ″
Damper turned through 2°	N. end towards E.,	increase of	western	declination	–1. 27
	N. end towards W.,	,,	,,	,,	+1. 25
Damper turned through 4°	N. end towards E.,	,,	,,	,,	–2. 16
	N. end towards W.,	,,	,,	,,	+3. 11
Damper turned through 6°	N. end towards E.,	,,	,,	,,	–3. 10
	N. end towards W.,	,,	,,	,,	+2. 55
Damper turned through 8°	N. end towards E.,	,,	,,	,,	–1. 22
	N. end towards W.,	,,	,,	,,	+1. 45

DAMPER REVERSED END FOR END.

Damper turned through 2°	N. end towards E.,	increase of	western	declination	+0. 12
	N. end towards W.,	,,	,,	,,	+0. 20
Damper turned through 4°	N. end towards E.,	,,	,,	,,	0. 0
	N. end towards W.,	,,	,,	,,	+0. 26
Damper turned through 6°	N. end towards E.,	,,	,,	,,	+0. 5
	N. end towards W.,	,,	,,	,,	+0. 5
Damper turned through 8°	N. end towards E.,	,,	,,	,,	–0. 10
	N. end towards W.,	,,	,,	,,	+0. 5

The first series shews clearly that the damper in its usual position drags the magnet; the second shews no certain effect. It seems that the damper possesses two kinds of magnetism, one permanent, the other transiently induced, of nearly equal magnitude; their sum being about $\frac{1}{100}$ part of the terrestrial effect for the same deflexion.

From 1865, July 25 to August 9, observations were made to ascertain whether the effect of an external deflecting cause is the same with the damper present and the damper removed. The observation was extremely difficult, as the magnet was perpetually in vibration when the damper was removed. A small magnet on the east side of the N. end of the magnetometer, with its north end pointing towards the East (and therefore diminishing the western declination of the magnetometer), was moved to the distance (about five feet) at which it produced a deviation of 5′ nearly. The apparent western declination was observed, damper present, and damper removed. It appeared to be less with damper present than with damper removed,

by 0'. 53''. The separate results are very discordant. If the conclusion has any validity, it tends to show a repulsive power in the damper, opposite to that found in the preceding experiments. This experiment is regarded as inconclusive.

9. Calculation of the constant used throughout the year 1877 in the reduction of the observations of the upper declination-magnet, the micrometer-head of the theodolite-telescope being East.

Reading for line of collimation - - - - - -		100r·064
		° ' ''
Micrometer equivalent - - - - - - -		−2. 37. 6·0
Correction for the plane glass in front of the box, in its usual position	-	+ 16·1
The collimator above the magnet. Correction for error of collimation	-	− 26. 26·0
Constant to be used in the reduction of the observations - - -		−3. 3. 15·9

10. Determination of the time of vibration of the upper declination-magnet under the action of terrestrial magnetism.

On 1873, August 7, it was found to be 31s·40; on 1874, December 31, 31s·33; on 1875, December 31, 31s·25; and on 1877, January 10, 31s·21.

11. Fraction expressing the proportion of the torsion-force to the earth's magnetic force.

By the same process which is described in the Magnetical Observations 1847, but with the system of suspension and silk skein at present in use, the proportion was found, on 1877, January 10, $\frac{1}{155}$; and on 1877, December 18, also $\frac{1}{155}$.

DETERMINATION OF THE READINGS OF THE HORIZONTAL CIRCLE OF THE THEODOLITE CORRESPONDING TO THE ASTRONOMICAL MERIDIAN.

The reading of the circle corresponding to the astronomical meridian is determined by occasional observation of the stars Polaris and δ Ursæ Minoris when near the meridian, either above or below pole. Six measures are usually taken on each night of observation.

The error of the level is determined by application of the spirit-level at the time of observation: due regard being paid, in the reduction, to the inequality of pivots already found. One division of the level is considered = 1''·0526. The azimuth-reading is then corrected by this quantity:

Correction = Elevation of W. end of axis × tan. star's altitude.

The readings of the azimuth circle increase as the instrument is turned from N. to E., S., and W.; from which it follows that (telescope pointing to North), the correction must have the same sign as the elevation of the W. end.

The correction for the azimuth of the star observed has been usually computed independently in every observation, by a peculiar method, of which the principle is fully explained in the volumes for 1840-1841, 1843, 1844, 1845. The formula and table used are the following :—

Let $A_{\prime\prime}$ = seconds of arc in star's azimuth,
C_s = seconds of time in star's hour-angle,
$a_{\prime\prime}$ = seconds of arc in star's N.P.D. for the day of observation,
Then $\log.\ A_{\prime\prime} = \log.\ C_s + \log.\ E + \log\ (a_{\prime\prime} + F) + \log.\ \cos.\ \Phi$.

The values of log. E, F, and log. cos. Φ, are given in the following table :—

TABULATED VALUES of LOG. COS. ϕ, for DIFFERENT VALUES of C_s, and of the QUANTITIES LOG. E, and F for the STARS, POLARIS and δ URSÆ MINORIS.

Hour Angle.	Log. Cos. ϕ for			
	Polaris.	δ Ursæ Minoris.	Polaris S.P.	δ Ursæ Min. S.P
m				
1	9·99999	9·99999	9·99999	9·99999
2	999	999	999	999
3	999	999	999	999
4	998	998	998	998
5	996	996	997	997
6	994	994	996	996
7	992	992	994	995
8	990	989	992	993
9	988	986	990	991
10	985	983	988	989
11	981	979	985	987
12	978	975	982	984
13	974	971	979	981
14	970	966	975	978
15	966	961	972	975
16	961	955	968	971
17	956	950	964	968
18	951	944	959	964
19	945	937	955	960
20	939	930	950	956
21	932	923	945	951
22	926	915	939	946
23	919	908	933	941
24	912	900	928	936
25	904	891	922	930
26	896	882	915	925
27	888	873	909	919
28	880	863	902	912
29	871	853	894	906
30	9·99862	9·99843	9·99887	9·99900
Log. E	6·09721	6·13638	−6·03899	−6·00617
F	−186″ ·79	−944″ ·71	+181″ ·57	+886″ ·86

Sometimes, when the star has been observed at larger hour angles, the azimuthal correction has been taken from a manuscript table, having for arguments "Hour Angle" and different values of "North Polar Distance."

Observations for determining the theodolite readings corresponding to the astronomical meridian were made on the following days in 1877 :—January 9, 19, 22, 25 ; February 16 ; March 10 ; April 19 ; May 30 ; July 10, 26 ; August 22, 30 ; September 11, 21, 26 ; November 3, 14 ; December 31. As a check on the continued steadiness of the theodolite, observations of a fixed mark (a small hole in a plate of metal above the Observatory Library) have been taken twenty times at intervals through the year. The concluded mean reading for the south astronomical meridian used, was $27^{\circ}. 5'. 38''\cdot 9$ throughout the year.

The following is a description of the method of making and reducing the eye-observations of the declination-magnet :—

A fine horizontal wire (as stated on page *vii*) is fixed in the field of view of the theodolite-telescope, and another fine vertical wire is fixed to a wire-plate, moved right and left by a micrometer screw. On looking into the telescope, the diagonally placed cross of the magnetometer is seen, and, during vibration of the magnet, will be observed to pass alternately right and left. The observation is made by turning the micrometer till its wire bisects the image of the magnet-cross at the pre-arranged times, and reading the micrometer. Then the verniers of the horizontal circle are read.

The mean-time clock is kept very nearly to Greenwich mean time (its error being ascertained each day), and the clock-time for each determination is arranged before hand. Chronometer M'Cabe 649 has usually been employed for observation.

If the magnet is in a state of disturbance, the first observation is made by the observer applying his eye to the telescope about one minute before the pre-arranged time ; he bisects the magnet-cross by the micrometer wire at 45^s, and again at 15^s before that time, also at 15^s and 45^s after that time. The intervals of these four observations are the same nearly as the time of vibration of the magnet, and the mean of all the times is the same as the pre-arranged time. The times of observation are usually $1^h. 5^m$, $3^h. 5^m$, $9^h. 5^m$, and $21^h. 5^m$ of Greenwich mean time.

The mean of each pair of adjacent readings of the micrometer is taken (giving three means), and the mean of these three is adopted as the result. In practice, this is done by adding the first and fourth readings to the double of the second and third, and dividing the sum by 6.

Till 1866, January 23, the magnet was usually in a state of vibration ; but, since the introduction of the water-damper on that day, the number of instances of excessive vibration has been very small. When it appears to be nearly free from

vibration, two bisections only of the cross are made, one about 15^s before the time recorded, the other about 15^s after that time, (30^s being nearly the time of a single vibration,) and the mean adopted as result. (The lower magnet, encircled by the copper damper, never exhibits any troublesome vibrations.)

The adopted result is converted into arc, supposing $1^r = 1'.34''\cdot 2$, and the quantity thus deduced is added to the mean of the vernier-readings, to which is applied the constant given in article 9 of the permanent adjustments; the difference between this number and the adopted reading for the Astronomical South Meridian is taken; and thus is deduced the magnetic declination, which is used in determining the zero for the photographic register.

§ 3. *General principle of construction of Photographic self-registering Apparatus for continuous Record of Magnetic and other Indications.*

The general principle adopted for all the photographic instruments is the same. For the register of each indication, a cylinder is provided, whose material is ebonite, and which is very accurately turned in the lathe. The axis of the cylinder is placed parallel to the direction of the change of indication which is to be registered. If there are two indications whose movements are in the same direction, both may be registered on the same cylinder; thus, the Declination and the Horizontal Force, whose indications of changes of the respective elements travel horizontally, can both be registered upon one cylinder with axis horizontal; the same remark applies to the register of two different galvanic Earth-Currents; the Vertical Force and the reading of the Barometer can both be registered upon one cylinder with axis vertical; and similarly the Dry-Bulb Thermometer and the Wet-Bulb Thermometer.

To the ends of each ebonite cylinder there are fixed circular brass plates, that which is near the clock-work having a diameter somewhat greater than that of the cylinder. In the further fittings there is a little difference between those for vertical and those for horizontal cylinders. Each horizontal cylinder has a pivot fixed in the brass plate at each end; these revolve each upon two antifriction wheels of the fixed frame. The vertical cylinders have no pivots; there is a perforation through the center of the lower or larger brass plate which, when the cylinder is mounted, is fitted upon a vertical spindle projecting upwards from the center of a second horizontal brass plate; this second brass plate sustains the weight of the vertical cylinder and turns horizontally, being supported by three antifriction wheels (each in a vertical plane) carried by the fixed frame.

Uniform rotatory motion is given to the cylinders by the action of clock-work, or rather chronometer-work, regulated by either duplex-escapement or chronometer-

escapement. For two of the cylinders, which revolve in 24 hours, and for the thermometer-cylinder which revolves in 50 hours, the axis is placed opposite to the center of the chronometer, and a fork at the end of the hour hand takes hold of a winch fixed to the plate of the cylinder, or (in the vertical cylinders) to the plate that sustains the cylinder. In the cylinder for galvanic earth-currents only, the connection is made by toothed wheels. For the horizontal cylinders, the plane of the chronometer work is vertical; for the vertical cylinders, it is horizontal.

The cylinders employed for the Declination and Horizontal Force registers, for the Vertical Force and Barometer registers, and for the Earth Current registers, are $11\frac{1}{2}$ inches high, and $14\frac{1}{4}$ inches in circumference; those for the thermometers are 10 inches high, and 19 inches in circumference.

Each cylinder is covered, when in use, by a tube of glass, which is open at one end, and has at the other end a circular plate of ebonite or brass, perforated at its center. The tube is a little larger than the cylinder; its open end is kept in position by a narrow collar of ebonite, and the opposite end by a circular piece of brass fixed to the smaller brass plate at the end of the cylinder.

To prepare the cylinder for register of indications, it is covered with a sheet of sensitised paper; the moisture on the paper usually causes the overlapping ends to adhere with sufficient firmness; the glass tube is then slipped over it, and the cylinder thus prepared is placed (if horizontal) with its pivots in bearing upon its two sets of antifriction wheels, or, (if vertical) with its end-brass-plate upon the rotating brass plate, and its central perforation upon the spindle of that plate; care is taken to ensure connection with the clock-work, and the apparatus is ready for action.

The trace for each instrument is produced by a flame of coal gas usually charged with the vapour of coal naphtha. For the magnetometers the light shines through a small aperture about $0^{in}\cdot3$ long, and $0^{in}\cdot01$ broad; for the earth-current-apparatus and for the barometer, the aperture is larger. The arrangements for throwing on the photographic paper of the revolving cylinder a spot of light which shall travel in the direction of the cylinder's axis with every motion of either magnetometer or galvanometer, or with the rise and fall of the mercury in the barometer, are as follows.

For each of the three magnetometers, a large concave mirror of speculum metal is carried by a part of the magnet-carrier; although it has a small movement of adjustment relative to the magnet-carrier, yet in practice it is very firmly clamped to it, so that the mirror receives all the angular movements of the magnet. The lamp above mentioned is placed slightly out of the direction of the straight line drawn from the center of the concave mirror to the center of the cylinder which carries the photographic paper. By the concave mirror, the light diverging from the aperture is made to converge to a place nearly on the surface of the cylinder carrying the photo-

graphic paper. The form of the aperture, however, and the astigmatism caused by the inclined reflexion from the mirror, produce this effect, that the image is somewhat elongated and is at the same time slightly curved. To diminish the length there is placed near the cylinder a system of plano-convex cylindrical lenses of glass, with their axes parallel to the axis of the cylinder, and the image is thus reduced to a neat spot of light.

For the registers of galvanic earth-currents, the light, which falls upon a plane mirror carried by each galvanometer, is made to converge to a spot, by a system of cylindrical lenses.

For the barometer, the light, condensed by a vertically placed cylindrical lens, shines through a small horizontal slit in a plate of blackened mica (which moves with the fluctuations of the quicksilver), and thus forms a spot of light.

For the thermometers, the light shines through the vacant part of the tube, and thus forms a sheet of light.

The spot of light (for the magnets, the earth-currents, and the barometer), or the boundary of the line of light (for the thermometers), moves, with the movements which are to be registered, in the direction of the axis of the cylinder, while the cylinder itself revolves. Consequently, when the paper is unwrapped from the cylinder, there is traced upon it (though not visible till the proper chemical agents have been applied) a curve, of which the abscissa measured in the direction of a line surrounding the cylinder is proportional to the time, while the ordinate measured in the direction parallel to the axis of the cylinder is proportional to the movement which is the subject of measure.

In the instruments for registering the motions of the magnets, the earth-currents, and the barometer, a line of abscissæ is actually traced on the paper, by a lamp giving a spot of light in an invariable position, the effect of which on the revolving paper is to trace a line surrounding the cylinder. For the thermometers this is not necessary, as the thermometer-scales are made to carry and to transfer to the photographic paper sufficient indications of the actual reading of the thermometers, by an apparatus which will be described in a following section.

Every part of the cylinder apparatus for the magnets and for the earth-currents is covered by cases of blackened zinc or wood, having slits for the moveable spots of light, and holes for the invariable spots; and all parts of the paths of the photographic light are protected as necessary by blackened zinc tubes from the admixture of extraneous light. The cylinder-apparatus for the thermometers is protected in the same manner, the whole, including the stems of the thermometers, and gas-lights, being enclosed in a second zinc case, blackened internally.

In all the instruments, the following method is used for attaching, to the sheet of photographic paper, indications of the time when certain parts of the photographic

trace were actually made, and for giving the means of laying down a time-scale applicable to every part of the trace. By means of a small moveable plate, arranged expressly for this purpose, the light which makes the trace can at any moment be completely cut off. An assistant, therefore, occasionally cuts off the light (registering in the proper book the clock-time of doing so), and after a few minutes withdraws the plate (again registering the time). The effect of this is to make a visible interruption in the trace, corresponding to registered times. By drawing lines from these points of interruption parallel to the axis of the cylinder, to meet the photographic line of abscissæ, or an adopted line of abscissæ parallel to it, points are defined upon the line of abscissæ corresponding to registered times. The whole length of the exposed part of the paper corresponds to the known time of revolution of the cylinder. A scale being prepared beforehand, whose value for the time of revolution corresponds in length to the circumference of the cylinder, the scale-readings for the registered times of interruption of light are applied to the ordinates corresponding to the interruptions, and the divisions of hours and minutes transferred at once from the scale to the line of abscissæ. In practice it is found that the length of the paper is not always the same, and it is necessary, therefore, to use for each instrument several pasteboard scales of different lengths, adapted to various lengths of the photographic sheets.

Since the year 1870, by means of an opening made in the chimneys of the registering lamps of the magnetometers, and in the chimneys of other lamps for the earth current galvanometers, the light at each instrument, when not interrupted, falls directly upon the cylindrical lens in front of the revolving cylinder, and, if allowed to act for a short time, produces, when the sheet is developed, a dark line upon the photographic paper. An apparatus of clock-work, specially arranged by Messrs. E. Dent and Co., acting upon small shutters, uncovers simultaneously the chimney-openings in all the lamps about $2\frac{1}{2}$ minutes before each hour, and covers them simultaneously about $2\frac{1}{2}$ minutes after each hour. In this way a good series of hour-lines in the direction of the ordinates is formed. By this arrangement increased accuracy of the time-registers has been obtained, and the labour of the computers much diminished. The system of interrupting the trace by hand is still retained, as giving means of checking the clock indication. No automatic registration of hour-lines has yet been arranged for the Barometer or for the Dry-bulb and Wet-bulb Thermometers.

§ 4. *Lower Declination-Magnet; and Photographic self-registering Apparatus for Continuous Record of Magnetic Declination.*

The lower declination-magnet is made by Simms. It is 2 feet long, $1\frac{1}{2}$ inch broad, $\frac{1}{4}$ inch thick, of hard steel throughout, much harder than the upper declination-magnet.

The magnet-frame consists of an upper piece, whose top is a hook, (to be hooked into the suspension-skein), and which carries a concave mirror used for the photographic record in the manner described above. The lower part of this upper piece turns in a graduated horizontal circle, similar to the torsion circle of the upper magnet, and attached to the lower piece or magnet-carrier proper. The lowest part of the carrier is a double square hook, in which the magnet is inserted and is kept in position by the pressure of three screws.

It has been mentioned in § 1 that a small pier, built upon one of the crossed slates which are laid upon three piers rising from below, carries the suspension-pulleys. The suspension-skein rises to one of these pulleys, passes horizontally over a second pulley about 5 inches south of it, and then descends obliquely to a windlass which is fixed to the stone slab about 2 ft. 3 in. south of the center of the magnet.

The height of the pulley above the floor of the Basement is 10 ft. $4\frac{3}{4}$ in. As the height of the magnet above the floor is 2 ft. $10\frac{1}{2}$ in., and the length of the magnet frame is 1 ft. 3 in., there remains 6 ft. $3\frac{1}{4}$ in. of free suspending skein.

One of the revolving cylinders is used for the photographic record of the Declination-Magnet and the Horizontal-Force-Magnet. In the preparation of the basement in 1864, as has been stated, the south-eastern re-entering angle was cut away, so that the straight line from the suspending skein of the declination-magnet to the center of those of the bifilar magnet passes through a clear space, in which the registering apparatus is placed.

The concave mirror of the declination-magnet is 5 inches in diameter, and is above the top of the magnet-box. The distance of the light aperture from the mirror is about 25·3 inches. The bright spot formed by the reflection of light from the mirror is received on the south side of the cylinder, near its west end.

For the declination-magnet, the values, in minutes and seconds of arc, of movements of the photographic spot in the direction of the ordinate, are thus deduced from a geometrical calculation founded on the measures of different parts of the apparatus. The distance of the cylinder from the concave mirror is 132·11 inches, and a movement of 1° of the mirror produces a movement of 2° in the reflected ray. From this it is found that 1° of movement of the mirror is represented by 4·611 inches upon the photographic paper. A small scale of paste-board is prepared, (for which a glass scale is in some operations substituted,) whose graduations correspond in value to minutes and seconds so calculated. The zero of the ordinate-scale is found in the following manner. The time-scale having been laid down as is already described, and actual observations of the position of the upper declination-magnet having been made with the eye and the telescope (as has been fully described at page *xiv*) at certain registered times, there is no difficulty (by means of these registered times) in defining the points of the photographic trace which

correspond to the observed positions. The pasteboard scale being applied as an ordinate to one of these points, and being slid up and down till the scale reading which represents the reading actually taken by the eye-observation falls on that point, the reading of the scale where it crosses the line of abscissæ is immediately found. This process rests on the assumption that the movements of the upper and lower magnets are exactly similar. The various readings given by different observations, so long as there is no instrumental change, will scarcely differ, and may be combined in groups, and thus an adopted reading for the line of abscissæ may be obtained. From this, with the assistance of the same pasteboard scale, there will be laid down without difficulty a new line, parallel to the line of abscissæ, whose ordinate would represent some whole number of degrees, or other convenient quantity.

§ 5. *Horizontal-Force-Magnet and Apparatus for observing it.*

The horizontal-force-magnet, furnished by Meyerstein of Göttingen, is, like the declination-magnet, 2 feet long, $1\frac{1}{2}$ inch broad, and about $\frac{1}{4}$ inch thick. For its support (as is mentioned at page *iv*), a brick pier in the eastern arm of the Magnetic Observatory, built on the ground below the basement floor, rises through the floor of the upper room, and carries a slate slab, to the top of which a brass frame is attached, carrying two brass pulleys (with their axes in the same east and west line) in front of the pier, and two (in a similar position) at the back of the pier; these constitute the upper suspension-piece. A small windlass is attached to the back of the pier at a convenient height. The magnet-carrier consists of two parts. The upper part is a horizontal bar, $2\frac{1}{2}$ inches long, whose ends are furnished with verniers for reading the graduations of the torsion-circle (a portion of the lower part, to be mentioned below). On the upper side of this horizontal bar are two small pulleys with axes horizontal and at right angles to the vertical plane passing through the length of the bar: by these pulleys the apparatus is suspended, as will be mentioned. From the lower side of the horizontal bar, a vertical axis projects downwards through the center of the torsion-circle, in which it turns by stiff friction. The lower part of the magnet-carrier consists, first of the torsion-circle, a graduated circle about 3 inches in diameter: next, immediately below the central part of the torsion-circle, is attached (but not firmly fixed) a circular piece of metal from which projects downwards a frame that, by means of three cramps and screws, carries the photographic concave mirror, with the plane of its front under the center of the vertical axis: this circular piece of metal has a radial arm upon which acts a screw carried by the torsion-circle, for giving to the concave mirror small changes of azimuthal position. Thirdly, there is fixed to the torsion-circle, at the back of the mirror-frame but not

touching it, a bar projecting downwards, bent horizontally under the mirror-frame and then again bent downwards, carrying the cramps in which the magnet rests: and, still lower, a small plane mirror, to which a fixed telescope is directed for observing by reflexion the graduations of a fixed scale (to be mentioned shortly). Under the two small pulleys mentioned above passes a skein of silk; its two branches rise up and pass over the front pulleys of the suspension-piece, then over its back pulleys, and then descend and pass under a single large pulley, whose axis is attached to a wire that passes down to the windlass. Supported by the two branches of the skein, the magnet swings freely, but the direction that it takes will depend on the angular position of its stirrup with respect to the upper horizontal bar; it is intended that the index should be brought to such a position on the torsion-circle that the two suspending branches should not hang in one plane, but should be so twisted that their torsion-force will maintain the magnet in a direction very nearly E. and W. magnetic (its marked end being W.); in which state an increase of the earth's magnetic force draws the marked end towards the N., till the torsion-force is sufficiently increased to resist it; or a diminution allows the torsion-force to draw it towards the S. The magnet, with its plane mirror, hangs within a double rectangular box (one box completely inclosed within another) covered with gilt paper, similar to that used for the declination-magnet; in its south side there is one long hole, covered with glass, through which the rays of light from the scale enter to fall on the plane mirror, and the rays reflected by the mirror pass to the fixed telescope. The vertical rod (below the torsion-circle), which carries the magnet-stirrup, passes through a hole in the top of the box. Above the magnet box is the concave mirror above mentioned. The height of the brass pulleys of the suspension-piece above the floor is $11^{ft.}\ 8^{in.}\cdot5$; that of the pulleys of the magnet-carrier is $4^{ft.}\ 2^{in.}\cdot5$; and that of the center of the plane mirror is about $3^{ft.}\ 1^{in.}$. The distance between the branches of the silk skein, where they pass over the upper pulleys, is $1^{in.}\cdot14$; at the lower pulleys the distance between them is $0^{in.}\cdot80$.

An oval copper bar (exactly similar to that for the declination-magnet), embraces the magnet, for the purpose of diminishing its vibrations.

The scale, which is observed by means of the plane mirror, is in a horizontal position, and is fixed to the South wall of the East arm of the Magnetic Basement. The numbers of the scale increase from East to West, so that when the magnet is inserted in the magnet-cell with its marked end towards the West, increasing readings of the scale (as seen with a fixed telescope directed to the mirror which the magnet carries) denote an increasing horizontal force. A normal to the scale from the center of the plane-mirror meets the scale at the division 51 nearly; the distance from the center of the plane-mirror to division 51 of the scale is 90·8 inches.

The telescope is fixed on the east side of the brick pier which supports the stone pier of the declination-theodolite in the upper observing room. The angle between

the normal to the scale (which coincides nearly with the normal to the axis of the magnet) and the axis of the telescope, is about 38°, and the plane of the mirror is therefore inclined to the axis of the magnet about 19°.

Observations relating to the permanent Adjustments of the Horizontal-Force-Magnet.

1. Determination of the times of vibration and of the different readings of the scale for different readings of the torsion-circle, and of the reading of the torsion-circle and the time of vibration when the magnet is transverse to the magnetic meridian.

To render the process intelligible, it may be convenient to premise the following explanation.

Suppose that the magnet is suspended in its stirrup which is firmly connected with the small plane mirror, with its marked end in a magnetic westerly direction (not exactly west, but in any westerly direction between north and south), and suppose that, by means of the telescope directed towards that mirror, the scale is read, or (which is the same thing) the position of the plane mirror and of the stirrup, and therefore that of the axis of the magnet, are defined. Now let the magnet be taken out of the stirrup and replaced with its marked end easterly. The terrestrial magnetic power will now act as regards torsion, in the direction opposite to that in which it acted before, and the magnet will therefore take up a different position. But by turning the torsion-circle, which changes the amount and direction of the torsion-power produced by the oblique tension of the suspending cords, the magnet may be made to take the same position, but with reversed direction of poles, as at first (which will be proved by the reading of the scale, as viewed in the plane mirror, being the same). The reading of the torsion-circle will now be different from what it was at first. The effect of this operation then is, to give us the difference of torsion-circle-readings for the same position of the magnet-axis with the marked end opposite ways, but it gives no information as to whether the magnet-axis is accurately transverse to the meridian, inasmuch as the same operation can be performed whether the magnet-axis is transverse or not.

But there is another observation which will inform us whether the magnet-axis is or is not accurately transverse. Let the time of vibration be taken in each position of the magnet. Resolve the terrestrial magnetic force acting on the poles of the magnet into two parts, one transverse to the magnet, the other longitudinal. In the two positions of the magnet (marked end westerly and marked end easterly, with axis in the same position), the magnitude of the transversal force is the same, and the changes which the torsion undergoes in a vibration of given extent are the same, and the time of vibration (if there were no other force) would be the same. But

there is another force, namely, the longitudinal force; and when the marked end is northerly, this tends from the center of the magnet's length, and when it is southerly it tends towards the center of the magnet's length; and in a vibration of given extent this produces force, in one case increasing that from the torsion and in the other case diminishing it. The times of vibration therefore will be different. There is only one exception to this, which is when the magnet-axis is transverse to the magnetic meridian, in which case the longitudinal force vanishes.

The criterion then of the position truly transverse to the meridian (which position is necessary in order that the indications of our instrument may apply truly to changes of the magnitude of terrestrial magnetic force without regard to changes of direction) is this. Find the readings of the torsion-circle which, with magnet in reversed positions, will give the same readings of the scale as viewed by reflexion in the plane mirror, and will also give the same time of vibration for the magnet. With these readings of the torsion-circle the magnet is transverse to the meridian; and the difference of the readings of the torsion-circle is the difference between the position when terrestrial magnetism acting on the magnet twists it one way, and the position when the same force twists it the opposite way, and is therefore double the angle due to the torsion-force of the suspending lines when they neutralize the force of terrestrial magnetism.

The following table exhibits the elements of the determination made on 1877, January 4:—

1877. Day.	The Marked end of the Magnet.							
	West.				East.			
	Torsion-Circle Reading.	Scale Reading.	Difference of Scale Readings for 1° of Torsion.	Mean of the Times of Vibration.	Torsion-Circle Reading.	Scale Reading.	Difference of Scale Readings for 1° of Torsion.	Mean of the Times of Vibration.
	°	div.	div.	s	°	div.	div.	s
Jan. 4	143	41·65		21·20	226	40·34		20·26
			7·89				8·10	
	144	49·54		21·02	227	48·44		20·40
			8·44				8·56	
	145	57·98		20·86	228	57·00		20·52
			7·94				7·73	
	146	65·92		20·68	229	64·73		20·66
			8·77				8·18	
	147	74·69		20·50	230	72·91		20·80
			7·25				8·33	
	148	81·94		20·36	231	81·24		20·98

The times of vibration and scale readings were sensibly the same, when the torsion-circle read 146°. 0′, marked end West, and 229°. 9′, marked end East, differing 83°. 9′. Half this difference, or 41°. 34′·5, is the angle of torsion when the magnet is transverse to the meridian. The value deduced from the whole of the observations above was 41°. 34′·3.

The value adopted in the reduction of observations through the year 1877 was 41°. 34′·25, as used in the three previous years.

The reading adopted for the torsion-circle, marked end of magnet west, was 146°. 0′ through the year.

2. Computation of the angle corresponding to one division of the scale, and of the variation of the horizontal force (in terms of the whole horizontal force) which moves the magnet through a space corresponding to one division of the scale.

It was found by accurate measurements, on 1864, November 3, that the distance from $51^{div.}$ on the scale to the center of the face of the plane mirror is 90·838 inches, and that the length of $30^{div.}·85$ of the scale is exactly 12 inches; consequently the angle at the mirror subtended by one division of the scale is 14′. 43″·25, or, for change of one division of scale-reading, the magnet is turned through an arc of 7′. 21″·625.

The variation of horizontal force (in terms of the whole horizontal force) for a disturbance through one division of the scale, is computed by the formula, "Cotan. angle of torsion × value of one division in terms of radius." Using the numbers above given, the value is found to be 0·002414 through the year 1877.

3. Determination of the compound effect of the vertical-force-magnet and the declination-magnet on the horizontal-force-magnet, when suspended with its marked end towards the West.

The details of the experiments, made while the old vertical-force-magnet was in use, will be found in the volumes for 1841, 1842, 1843, 1844, 1845. The effect was to increase the readings by $0^{div.}·487$. On mounting a new vertical-force-magnet in 1848, similar experiments were made, and the resulting number was $0^{div.}·45$. These quantities are totally unimportant in their influence on the registers of changes of horizontal force. No experiments have been made since the magnets were placed in the basement.

4. Effect of the damper.

In the year 1865, from May 17 to May 25, observations were made for ascertaining the deflection of the magnet produced by turning the damper through a small angle round a vertical axis passing through its center.

DAMPER IN USUAL POSITION.

				div.
Damper turned through 2°	W. end towards S., increase of scale-reading		....	−0·251
	W. end towards N.,	,,	,, ...	+0·050
Damper turned through 4°	W. end towards S.,	,,	,, ...	−0·34
	W. end towards N.,	,,	,, ...	+0·16

DAMPER REVERSED END FOR END.

				div.
Damper turned through 2°	W. end towards S., increase of scale-reading		....	−0·15
	W. end towards N.,	,,	,, ...	−0·02
Damper turned through 4°	W. end towards S.,	,,	,, ...	−0·12
	W. end towards N.,	,,	,, ...	+0·08

On 1865, July 25, observations were made to ascertain whether the effect of an external deflecting cause is the same with the damper present and the damper removed. A small magnet was placed with its marked end pointing N. at the distance 4 feet S. of the unmarked end of the horizontal-force-magnet, deflecting the magnet through 1^{div} of the scale, and the scale-readings were observed with the damper in its usual place and the damper away. Three experiments were made, containing twenty-four observations of position. Not the smallest difference of position of the horizontal-force-magnet was produced by the presence or absence of the damper. The observations were very easy, and the result is certain.

No experiments on the damper have been made since 1865.

5. Determination of the correction for the effect of temperature on the horizontal-force-magnet.

In the Introduction to the volume of Magnetical and Meteorological Observations for 1847 will be found a detailed account of observations made in the years 1846 and 1847 for determination of this element. The principle adopted was that of observing the deflection which the magnet (to be tried) produces on another magnet; the magnet (to be tried) being carried by the same frame which carries the telescope that is directed to the plane mirror attached to the other magnet, and which also carries the scale that is viewed in these experiments by reflection in that plane mirror. The rotation of the frame was measured by a graduated circle about 23 inches in diameter. The magnet (to be tried) was always on the eastern side of the other magnet. It was enclosed in a copper trough, which was filled with water at different temperatures. One end of the magnet (to be tried) was directed towards the other magnet. The values found for correction of the results as to horizontal force determined with the magnet at temperature t° in order to reduce them to what they would have been if the temperature of the magnet had been 32°, expressed as multiples of the whole horizontal force, were,*

When the marked end of the magnet (to be tried) was West,

$$0{\cdot}00007137\,(t-32) + 0{\cdot}000000898\,(t-32)^2.$$

When the marked end of the magnet (to be tried) was East,

$$0{\cdot}00009050\,(t-32) + 0{\cdot}000000626\,(t-32)^2.$$

The mean, or

$$0{\cdot}00008093\,(t-32) + 0{\cdot}000000762\,(t-32)^2$$

has been embodied in tables which have been used in the computation of the "Reduction of Magnetic Observations 1848–1857," attached to the Volume of Observations 1859, and in the computation for "Days of Great Magnetic Disturbance 1841–1857," attached to the volume for 1862. The same formula has been employed in

* By inadvertence in printing the Introduction, 1847, the letter *t* has been used in two different senses.

the "Reduction of the Magnetic Observations from 1858–1863," published in the volume for 1867.

In the year 1864 observations were made for ascertaining the temperature-coefficient by heating the magnet by hot air. The magnet, whose variation of power in different temperatures was to be determined, was placed in a copper box planted upon the top of a copper gas stove, whose heat could be regulated by manipulation of a tap, and from which rose a stream of heated air (not the air vitiated by combustion) through a large opening in the bottom of the box. The stove used for this purpose was the same which is now used for warming the Magnetic Basement. It was placed in the Magnetic Office, No. 7, in a position magnetic south of the deflexion-apparatus used in the operation for ascertaining the absolute measure of horizontal magnetic force. The hot air which rose through the opening in the center of the bottom was discharged by adjustible openings near the extreme ends of the top. Three windows were provided for reading three thermometers. The box, and the magnet which it inclosed, were placed in a magnetic E. and W. position. The needle whose deflection exhibited the power of the magnet was that which is employed in the ordinary use of the deflexion-apparatus. The proportion of the power of the magnet (under definite circumstances) to the earth's directive horizontal power was expressed by the tangent of the angle of deviation. Observations were made with temperatures both ascending and descending. The intervals of observation at different temperatures were sufficiently small to permit the assumption that the earth's force had not sensibly changed. The following is an abstract of the principal results:—

Omitting some days of less perfect series, satisfactory series of observations were made on 1864, February 21, 22, 23, and March 10. The tangents of angle of deflection were as follows:—

13	observations	with marked end E	at mean temperature	36°·8	Fahrenheit gave	0·403711
13	"	" W				
21	"	marked end E	"	61·3	"	0·400836
25	"	" W				
17	"	marked end E	"	90·3	"	0·400579
16	"	" W				

From these it was inferred that the tangent of angle of deflection could be represented by—

$$0\cdot404559 \times \left\{1 - 0\cdot0004610 \times (t - 32) + 0\cdot000005061 \times (t - 32)^2\right\}$$

On comparing the quantity within the bracket (which expresses the law of magnetic power as depending on temperature) with that found in 1847, which, as above stated, is—

$$\left\{1 - 0\cdot00008093 \times (t - 32) - 0\cdot000000762 \times (t - 32)^2\right\}$$

it will be seen that the difference is great. The second terms differ greatly in magnitude, and the third terms in sign.

Possibly some light may be thrown on the difference by the following remark. The two formulæ give the same values for $t = 32°$ and for $t = 97°{\cdot}3$. And they give equal degrees of change per degree when $t = 65°$. It would seem therefore that the real discordance is in the experimental values for the mean temperatures only, or principally; and that it is probable that there is some error in the hot-air process for the middle temperatures.

I insert here (although not applying to the observations of the present volume) the results of a similar examination of the Old Vertical Force Magnet, which was in use from 1848 to the beginning of 1864. Omitting less perfect series, observations made on 1864, February 21 and 24, gave the following values for tangents of angles of deflection:—

7 observations with marked end E 7 ,, ,, W	at mean temperature	34·2	Fahrenheit	gave	0·279985
9 ,, marked end E 11 ,, ,, W	,,	57·0	,,		0·275111
7 ,, marked end E 7 ,, ,, W	,,	86·5	,,		0·270778

From these it was inferred that the tangent of angle of deflection could be represented by—

$$0{\cdot}280526 \times \left\{1 - 0{\cdot}00088607 \times (t - 32) + 0{\cdot}0000045594 \times (t - 32)^2\right\}$$

The expression found in 1847 for the law of force in the original Vertical Force Magnet was—

$$\left\{1 - 0{\cdot}00015816 \times (t - 32) - 0{\cdot}000001172 \times (t - 32)^2\right\}$$

giving a discordance of the same kind as that found for the horizontal force, but still larger. The formulæ agree only when $t = 32°$ and when $t = 159°{\cdot}0$. The discordance cannot be removed by a supposition similar to that made above.

Returning now to the temperature-correction of the Horizontal Force Magnet. The unsatisfactory character of the comparisons just given induced me at the beginning of 1868 to try the method of heating the air of the Magnetic Basement generally (by means of the gas-stove), leaving the magnets in all respects in their ordinary state, and comparing their indications as recorded in the ordinary way, but at different temperatures.* Experiments were at first made at intervals of a few hours in the course of one day, but it was soon found that the magnet did not acquire the proper temperature; moreover, the result was evidently affected by

* This method was first used for magnets, so far as I am aware, at the Kew Observatory. It had been used for pendulums by General Sir Edward Sabine and by myself.

diurnal inequality. After this, an entire day was in each case devoted to the effects of each temperature (high or low, as the case might be). The principal series of observations were made with the horizontal force magnet in its ordinary position, or marked end to the west; but a few were made with the marked end to the east. In some instances, the numbers given are the result each of several observations; but in other instances, the result is that of a single observation, taken when all the apparatus had acquired unusual steadiness. The following are the results:—

RESULTS OF TEMPERATURE EXPERIMENTS UPON THE HORIZONTAL FORCE MAGNET, MARKED END WEST.

1868. Month and Day. (Civil.)		Temperature.	Scale Reading.	Change of Temperature.	Change of Scale Reading.	Change of Scale Reading reduced to Parts of the whole Horizontal Force.	Change of Horizontal Force corresponding to a change of 1° of Temperature (in Parts of the whole H.F.).
		°	div.	°	div.		
January	3	56·8	60·82	6·3	0·65	0·001579	0·000250
	3	50·5	61·47				
	4	49·5	61·47	6·0	0·12	·000292	·000049
	4	55·5	61·35				
	6	59·3	60·91	10·0	0·71	·001725	·000172
	7	49·3	61·62	7·4	0·57	·001385	·000187
	9	56·7	61·05				
	10	58·9	60·91	7·6	0·80	·001943	·000256
	11	51·3	61·71	8·0	0·53	·001288	·000161
	12	59·3	61·18				
	13	59·5	61·26	5·6	0·16	·000389	·000070
	14	53·9	61·42				
	14	55·2	61·74	2·7	0·31	·000753	·000279
	16	52·5	62·05	9·0	1·27	·003086	·000343
	17	61·5	60·78	8·0	0·46	·001118	·000143
	18	53·5	61·24	6·1	0·31	·000753	·000123
	19	59·6	60·93				
January	31	60·7	58·63	10·1	0·31	·000753	·000075
February	4	50·6	58·94	9·7	0·88	·002138	·000220
	5	60·3	58·06	9·2	0·80	·001943	·000211
	7	51·1	58·86	8·5	0·82	·001992	·000234
	10	59·6	58·04				
	14	59·7	58·64	9·6	0·82	·001992	·000208
	16	50·1	59·46	9·7	0·49	·001190	·000123
	18	59·8	58·97	11·6	0·48	·001166	·000100
	20	48·2	59·45	10·6	0·43	·001045	·000099
	21	58·8	59·02				
Mean .	.	..	..	..	..	....	0·000174

RESULTS OF TEMPERATURE EXPERIMENTS UPON THE HORIZONTAL FORCE MAGNET, MARKED END EAST.

1868. Month and Day. (Civil.)	Temperature.	Scale Reading.	Change of Temperature.	Change of Scale Reading.	Change of Scale Reading reduced to Parts of the whole Horizontal Force.	Change of Horizontal Force corresponding to a change of 1° of Temperature (in Parts of the whole H.F.).
	°	div.	°	div.		
January 21	60·2	60·73				
22	50·5	59·31	9·7	1·42	0·003449	0·000355
24	58·6	62·56				
24	51·3	61·54	7·3	1·02	·002477	·000339
27	59·3	61·86	8·0	0·32	·000777	·000097
29	49·0	61·51	10·3	0·35	·000850	·000083
31	60·9	61·81	11·9	0·30	·000729	·000061
Mean . .	..	...	..	..	....	0·000187

These results do not differ greatly from those which are given by application of the formula found in 1847. It is important to observe that they include the entire effects of temperature upon all the various parts of the mounting of the magnet, as well as on the magnet itself; and for this reason I think them deserving of great confidence. Still I have thought it prudent, at present, to omit application of corrections for temperature.

The method of observing with the horizontal-force-magnet is the following:—

A fine vertical wire is fixed in the field of view of the telescope, which is directed to the plane mirror carried by the magnet. On looking into the telescope, the graduations of the fixed scale, mentioned in page *xxi*, are seen; and during the oscillations of the magnet, the divisions of the scale are seen to pass alternately right and left across the wire. The clock-time, for which the position of the magnet is to be determined, is 5 minutes later than that for the observation of declination. The first observation is made by the observer applying his eye to the telescope 40^s before the arranged time, and, if the magnet is in a state of vibration, he observes the next four extreme points of vibration of the scale, and the mean of these is adopted in the same manner as for the declination-observations; but if it appears to be at rest, then at 10^s before the pre-arranged time, he notes the reading of the scale; and 10^s after the pre-arranged time he notes whether the reading continues the same, and if it does, that reading is adopted as the result. If there is a slight difference in the readings, the mean is taken. The times of observation are usually 1^h, 3^h, 9^h, and 21^h of Greenwich mean time.

The number of instances when the magnet was observed in a state of vibration during the year 1877 is very small.

Outside the double box is suspended a thermometer which is read on every week day, at 0^h, 1^h, 2^h, 3^h, 9^h, 21^h, 22^h, and 23^h. A few readings are taken on Sunday.

Self-registering maximum and minimum thermometers placed outside the box were formerly read twice every day, but in consequence of the very small diurnal range of temperature, these observations have not been continued.

§ 6. *Photographic self-registering Apparatus for Continuous Record of Magnetic Horizontal Force.*

Referring to the general description of photographic apparatus, the following remarks apply more particularly to that which is attached to the horizontal-force-magnet. A concave mirror of speculum-metal, 4 inches in diameter, is carried by the magnet-carrier. The light of a gas-lamp shines through a small aperture about $0^{in}\cdot3$ high, and $0^{in}\cdot01$ broad (which is supported by the solid base of the brick pier carrying the magnet-support), at the distance of about 21·25 inches from the concave mirror, and is made to converge to a point, on the north surface and near the east end of the same revolving cylinder which receives the light from the concave mirror of the declination-magnet. A cylindrical lens parallel to the axis of the cylinder receives the somewhat elongated image of the source of light, and converts it into a well-defined spot. The motions of this spot parallel to the axis represent the angular movements of the magnet which are produced by an increase of terrestrial magnetic force overcoming more completely the torsion-force of the bifilar suspension, or by a diminution of terrestrial force yielding to the torsion-force.

As the spot of light from the horizontal-force-mirror falls on the side of the cylinder opposite to that on which the light from the declination-mirror falls, the same time-scale will not apply to both; it is necessary to prepare a time-scale independently for each.

The following is the calculation by which the scale of horizontal force on the photographic sheet is determined. The distance between the surface of the concave mirror and the surface of the cylinder is 134·436 inches; consequently, one degree of angular motion of the magnet, producing two degrees of angular motion of the reflected ray, moves the spot of light through 4·6927 inches. For the year 1877 the adopted value of variation of horizontal force for one degree of angular motion of the magnet $=$ sin. 1° $\times$ cotan. 41°. 34′·25 $=$ 0·019679; and the movement of the spot of light for 0·01 part of the whole horizontal force is 2·385 inches. With this fundamental number, the graduations of the pasteboard scale for measure of horizontal force have been prepared.

§ 7. *Vertical-Force-Magnet, and Apparatus for observing it.*

The vertical-force-magnet in use to 1848 was made by Robinson; that in use from 1848 to 1864, January 20, was by Barrow. The magnet now in use is by

Simms. Its length is $1^{ft.}\ 6^{in.}$; it is pointed at the ends. After some trials, it was re-magnetized by Mr. Simms on 1864, June 15. Between 1864, August 27, and September 27, a new knife-edge was attached to it, to remedy a defect which, as was afterwards found, arose from a cause that had no relation to the knife-edge. Its supporting frame rests upon a solid pier, built of brick and capped with a thick block of Portland stone, in the western arm of the magnetic basement. Its position is as nearly as possible symmetrical with that of the horizontal-force-magnet in the eastern arm. Upon the stone block is fixed the supporting frame, consisting of two pillars (connected at their bases) on whose tops are the agate planes upon which vibrate the extreme parts of the knife-edge (to be mentioned immediately). The carrier of the magnet is an iron frame, to which is attached, by clamps and pinching screws, a steel knife-edge, about 8 inches long. The steel knife-edge passes through an aperture in the magnet. The axis of the magnet is as nearly as possible transverse to the meridian, its marked end being east. The axis of vibration is as nearly as possible north and south. To the southern end of the iron frame, and projecting further south than the end of the knife-edge, is fixed a small plane mirror, whose plane makes with the axis of the magnet an angle of $52\frac{3}{4}^{\circ}$ nearly. The fixed telescope (to be mentioned) is directed to this mirror, and by reflexion at the surface of the mirror it views a vertical scale (to be mentioned shortly). The height of this mirror above the floor is about $2^{ft.}\ 10^{in.}\cdot 6$. Before the introduction of the photographic methods, the magnet was placed in a perforation of a brass frame midway between its knife-edges. But since the photographic method was introduced, the magnet has been placed excentrically; the distance of its southern face from the nearest end of the southern knife-edge being nearly 2 inches, and a space of $4\frac{1}{2}$ inches in the northern part of the iron frame being left disposable. In this disposable space there is attached to the iron frame by three clips a concave mirror of speculum-metal, with its face at right angles to the length of the magnet; it is used in the photographic system (shortly to be described). Near the north end of the iron frame are fixed in it two screw-stalks, upon which are adjustible screw-weights; one stalk is horizontal, and the movement of its weight affects the position of equilibrium of the magnet (which depends on the equilibrium between the moments of the vertical force of terrestrial magnetism on the one hand and of the magnet's center of gravity on the other hand); the other stalk is vertical, and the movement of its weight affects the delicacy of the balance, and varies the magnitude of its change of position produced by a change in the vertical force of terrestrial magnetism.

The whole is inclosed in a rectangular box. This box is based upon the stone block above mentioned; and in it, in a space separated from the rest by a thin partition, the magnet vibrates freely in the vertical plane. In the south side of the box is a hole covered by glass, through which pass the rays of light from the scale to the plane mirror, and through which they are reflected from the plane mirror to the

telescope. And at the east end is a large hole covered by glass, through which passes the light from the lamp to the concave mirror, and through which it is reflected to the photographic cylinder (to be described hereafter).

The telescope is fixed to the west side of the brick pier which supports the stone pier in the upper room carrying the declination-theodolite. Its position is symmetrical with that of the telescope by which the horizontal-force-magnet is observed: so that a person seated in a convenient position can, by an easy motion of the head left and right, observe the vertical-force and horizontal-force-magnets.

The scale is vertical: it is fixed to the pier which carries the telescope, and is at a very small distance from the object-glass of the telescope. The wire in the field of view of the telescope is horizontal. The telescope being directed towards the mirror, the observer sees in it the reflected divisions of the scale passing upwards and downwards over the fixed wire as the magnet vibrates. The numbers of the scale increase from top to bottom; so that, when the magnet is placed with its marked end towards the East, increasing readings (as seen with the fixed telescope) denote an increasing vertical force.

OBSERVATIONS RELATING TO THE PERMANENT ADJUSTMENTS OF THE VERTICAL-FORCE-MAGNET.

1. Determination of the compound effect of the declination-magnet, the horizontal-force-magnet, and the iron affixed to the electrometer pole, on the vertical-force-magnet.

The experiments applying to the magnets are given in the volumes for 1840–1841 to 1845: and those applying to the electrometer pole in the volume for 1842. It appeared that no sensible disturbance was produced on the magnet formerly in use. No experiments have been made with the new magnet.

2. Determination of the time of vibration of the vertical-force-magnet in the vertical plane.

In the year 1877, vibrations of the vertical-force-magnet were observed on 91 different days, and with readings of various divisions of the scale. The mean time of vibration adopted for the year was $16^{s}{\cdot}206$.

3. Determination of the time of vibration of the vertical-force-magnet in the horizontal plane.

1877, January 2–3. The magnet with all its apparatus was suspended from a tripod in Magnetic Office, No. 6, its broad side being in a plane parallel to the horizon: therefore, its moment of inertia was the same as when it is in observation. A telescope, with a wire in its focus, was directed to the reflector carried by the magnet. A scale of numbers was placed on the floor of the room, at right angles to the long axis of the magnet, or parallel to the mirror. The magnet was observed

only at times when it was swinging through a small arc. From 1,000 vibrations, the mean time of one vibration $=16^{s}\cdot959$. This number is used through the year 1877.

4. Computation of the angle through which the magnet moves for a change of one division of the scale; and calculation of the disturbing force producing a movement through one division, in terms of the whole vertical force.

The distance from the scale to the mirror is 186·07 inches, and each division of the scale $=\frac{12}{30\cdot85}$ inches. Hence the angle which one division subtends, as seen from the mirror, is 7′. 11″·19; and therefore the angular movement of the normal to the mirror, corresponding to a change of one division of the scale, is half this quantity, or 3′. 35″·60.

But the angular movement of the normal to the mirror is not the same as the angular movement of the magnet; but is less in the proportion of unity to the cosine of the angle which the normal to the mirror makes with the magnet, or in the proportion of unity to the sine of the angle which the plane of the mirror makes with the magnet. This angle has been found to be $52\frac{3}{4}^{\circ}$; therefore, dividing the result just obtained by sine $52\frac{3}{4}^{\circ}$, we have, for the angular motion of the magnet corresponding to a change of one division of the scale, 4′. 30″·85.

From this, the value, in terms of the whole vertical force, of the disturbing force, producing a change of one division, is to be computed by the formula, "Value of Division in terms of radius $\times$ cotan. dip $\times \frac{T'^{2}}{T^{2}}$"; where T' is the time of vibration in the horizontal plane, and T the time of vibration in the vertical plane.

For the year 1877, T' was assumed $= 16^{s}\cdot959$, $T = 16^{s}\cdot206$, dip $= 67^{\circ}. 39'. 38''$. From these numbers, the change of the vertical force, in terms of the whole vertical force, corresponding to one division of the scale, is found $= 0\cdot000591$.

5. Investigation of the temperature-correction of the vertical-force-magnet.

The new vertical-force-magnet was subjected to experiments by inclosing it in a copper box, and warming it by an injection of hot air, and observing the amount of deviation which it produced on the suspended magnet used in the deflexion-apparatus for absolute measure of horizontal force, at the same time and in the same manner as were the horizontal-force-magnet and the old vertical-force-magnet, in the experiments described in pages *xxxi* and *xxxii*. Observations made on 1864, February 20, 25, March 3, 9, gave, for the tangents of the angles of deflection,—

16 observations with marked end E	} at mean temperature		36·6	Fahrenheit, gave	0·172352
18 ,, ,, W					
33 ,, marked end E	}	,,	62·2	,,	0·171657
29 ,, ,, W					
26 ,, marked end E	}	,,	93·3	,,	0·171389
27 ,, ,, W					

From these it appeared that the tangent of the angle of deflection might be represented by—

$$0\cdot172522 \times \left\{1 - 0\cdot0002233 \times (t - 32) + 0\cdot000001894 \times (t - 32)^2\right\}$$

The quantity within the brackets (which represents the variation of magnetic power in terms of the whole power of the magnet) shows the same peculiarities as those found for the other magnets; that the third term is large, and has a sign opposite to that of the second term.

The factor of variation for 1° of Fahrenheit, when $t = 62°$, is $-$ 0·0001097.

After these observations, the new vertical-force-magnet was re-magnetized by Mr. Simms, on 1864, June 15.

In the beginning of 1868, observations were made in the method already described for the horizontal-force-magnet, by heating the magnetic basement to different temperatures, and observing the scale-reading in the ordinary way. The results are as follows:—

RESULTS OF TEMPERATURE EXPERIMENTS UPON THE VERTICAL-FORCE-MAGNET.

1868. Month and Day.		Temperature.	Scale Reading.	Change of Temperature.	Change of Scale Reading.	Change of Scale Reading reduced to Parts of the whole Vertical Force.	Change of Vertical Force corresponding to a change of 1° of Temperature (in Parts of the whole V.F.)
		°	div.	°	div.		
January	3	56·0	56·45				
	4	48·2	46·52	7·8	9·93	0·006482	0·000831
	5	59·6	61·49	11·4	14·97	·009772	·000857
January	6	59·6	61·73				
	7	49·0	46·84	10·6	14·89	0·009720	·000917
	10	59·5	61·62	10·5	14·78	·009648	·000919
	11	49·7	48·70	9·8	12·92	·008434	·000861
	12	62·0	64·40	12·3	15·70	·010249	·000833
	13	53·4	53·33	8·6	11·07	·007226	·000840
	14	55·4	55·72	2·0	2·39	·001560	·000780
	16	52·3	50·79	3·1	4·93	·003218	·001038
	17	63·7	66·13	11·4	15·34	·010014	·000878
	18	52·4	53·26	11·3	12·87	·008402	·000743
	20	60·7	62·19	8·3	8·93	·005829	·000702
	22	50·6	47·82	10·1	14·37	·009381	·000929
	23	59·6	59·60	9·0	11·78	·007690	·000854
	25	49·6	46·67	10·0	12·93	·008441	·000844
	26	60·5	60·62	10·9	13·95	·009107	·000836
	29	49·3	44·78	11·2	15·84	·010340	·000923
	31	63·1	64·55	13·8	19·77	·012906	·000935
February	4	51·0	47·11	12·1	17·44	·011385	·000941
	5	62·3	64·02	11·3	16·91	·011039	·000977
	6	50·6	46·43	11·7	17·59	·011483	·000981
	7	53·3	49·10	2·7	2·67	·001743	·000646
	8	50·6	45·55	2·7	3·55	·002317	·000858
	10	62·1	62·76	11·5	17·21	·011235	·000977
February	14	60·6	57·70				
	16	49·0	36·75	11·6	20·95	·011298	·000974
	18	61·9	58·85	12·9	22·10	·011919	·000924
February	18	61·9	58·05				
	20	50·0	41·96	11·9	16·09	·011749	·000987
	21	62·6	56·82	12·6	14·86	·010851	·000861
Mean . .		. .	. .	. .		. .	0·000880

The coefficient of temperature-correction given by these experiments is enormously greater than any that has been found in any previous experiments. Yet I conceive that there can be no doubt of its accuracy. And it is easy to see that an instrument, subjected to the effects of gravity working differentially on its two ends, is liable to great changes depending on temperature which have no connection with magnetism. For instance, if the point, at which the magnet is grasped by its carrier, is not absolutely coincident with its center of gravity, a sensible change in the space intervening between the grasping point and the center of gravity, and a great change of magnetic position, may be produced by a small change of temperature. There appears to be no way of avoiding these evils but by maintaining almost uniform temperature; a condition which has been almost perfectly preserved in the year 1877. In the observations which follow, no correction is applied for temperature.

The method of observing with the vertical-force-magnet is the following:—

A fine horizontal wire is fixed in the field of view of the telescope, which is directed to the small plane mirror carried by the magnet. On looking into the telescope, the graduations of the fixed vertical scale are seen; and during the oscillations of the magnet, the divisions of the scale are seen to pass alternately upwards and downwards across the wire. The clock-time, for which the position of the magnet is to be determined, is the same as that for the horizontal force magnet. The observer applies his eye to the telescope about two vibrations before the arranged time, and if the magnet is in motion he observes its place at four extreme vibrations; and the mean of these is taken as for the horizontal-force-magnet. But if the magnet is apparently at rest, then at one half-time of vibration before the arranged time, and at an equal interval after the arranged time, the reading of the scale is noted; if the reading continues the same that reading is adopted, if there is a slight difference, the mean is taken. The times of observation are usually 1^h, 3^h, 9^h, and 21^h of Greenwich mean time.

The number of instances in 1877 in which the magnet was found in a state of vibration is very small.

Outside the box is placed a thermometer, which is read on every week day at 0^h, 1^h, 2^h, 3^h, 9^h, 21^h, 22^h, and 23^h. A few readings are taken on Sunday. Self-registering maximum and minimum thermometers were formerly read twice daily, but in consequence of the very small diurnal range of temperature these observations have not been continued.

§ 8. *Photographic self-registering Apparatus for Continuous Record of Magnetic Vertical Force.*

The concave mirror which is carried by the vertical-force-magnet is 4 inches in diameter; its mounting has been described in the last article. At the distance of about 22 inches from that mirror, and external to the box, is the horizontal aperture.

about $0^{in}\cdot3$ in length and $0^{in}\cdot01$ in breadth, carried by the same stone block which carries the supports of the agate planes. The lamp which shines through this aperture is carried by a wooden stand. The light reflected from the mirror passes through a cylindrical lens with its axis vertical, very near to the cylinder carrying the photographic paper, and finally forms a well-defined spot of light on the cylinder of paper, at the distance of 100·18 inches from the mirror. As the movements of the magnet are vertical, the axis of the cylinder is vertical. The cylinder is about $14\frac{1}{4}$ inches in circumference, being of the same dimensions as those used for the declination and horizontal-force magnets, and for the earth-currents. The forms of the exterior and interior cylinders, and the method of mounting the paper, are in all respects the same as for the declination and horizontal-force magnets; but the cylinder is supported by being merely planted upon a circular horizontal plate (its position being defined by fitting a central hole in the metallic cap of the cylinder upon a central pin in the plate), which rests on anti-friction rollers and is made by watchwork to revolve once in twenty-four hours. The trace of the vertical-force-magnet is on the west side of the cylinder.

On the east side, the cylinder receives the trace produced by the barometer (to be described hereafter). A pencil of light from the lamp which is used for the barometer shines through a fixed aperture; and by a system of prisms and a small cylindrical lens, a photographic base-line is traced upon the cylinder of paper, similar to that on the cylinder of the declination and horizontal-force magnets.

The scale for the ordinates of the photographic curve of the vertical force is thus computed. Remarking that the radius which determines the range of the motion of the spot of light is double the distance 100·18 inches, and is therefore = 200·36 inches, the formula used in the last section, when applied to $\frac{\text{disturbing force}}{\text{whole vertical force}} = 0{\cdot}01$, gives value of division $= 200{\cdot}36 \times \tan.\text{ dip.} \times \left(\frac{T}{T'}\right) \times 0{\cdot}01$. The value of the ordinate of the photographic curve for $\frac{\text{disturbing force}}{\text{whole vertical force}} = 0{\cdot}01$, thus obtained, is, for the year 1877, = 4·152 inches. With this value, the pasteboard scales, used for measuring the photographic ordinates, have been prepared.

§ 9. *Dipping Needles, and Method of observing the Magnetic Dip.*

The instrument with which all the dips in the year 1877 have been observed, is that which, for distinction, is called Airy's instrument. The following description will probably suffice to convey an idea of its peculiarities:—

The form of the needles, the form of their axes, the form of the agate bearings, and the general arrangement of the relieving apparatus, are precisely the same as those in Robinson's and other instruments. But the form of the observing apparatus is greatly modified, in order to secure the following objects:—

I. To obtain a microscopic view of the points of the needles, as in the instruments introduced by Dr. Lloyd and General Sir E. Sabine.

II. To possess at the same time the means of observing the needles while in a state of vibration.

III. To have the means of observing needles of different lengths.

IV. To give an illumination to the field of view of each microscope, directed from the side opposite to the observer's eye, so that the light may enter past the point of the needle into the object glass of the microscope, forming a black image of the needle-point in a bright field of view.

V. To give facility for observing by day or night.

With these views, the following form is given to the apparatus:—

The needle, and the bodies of the microscopes, are inclosed in a square box. The base of the box, two vertical sides, and the top, are made of gun-metal (carefully selected to insure its freedom from iron); but the sides parallel to the plane of vibration of the needle are of glass. Of the two glass sides, that which is next the observer is firmly fixed; it is hereafter called "the graduated glass-plate." The other glass side can be withdrawn, to open the box, for inserting the needle, &c.

An axis, whose length is perpendicular to the plane of vibration of the needles, and is as nearly as possible in the line of the axis of the needle, supported on two bearings (of which one is cemented in a hole in the graduated glass-plate, the other being upon a horizontal bar near to the agate support of the needle-axis), carries a transverse arm, about 11 inches long, or rather two arms, projecting about $5\frac{1}{2}$ inches on each side of the axis. Each of these projecting arms carries three fixed microscopes on each side, adapted in position to the lengths of the needles to be mentioned shortly.

The microscope-tube thus carried is not the entire microscope, but so much as contains the object-glass and the field-glass. Upon the plane side of the field-glass (which is turned towards the object-glass), a series of parallel lines is engraved by etching with fluoric acid. The object-glass is so adjusted that the image of the needle-point is formed upon the plane side of the field-glass; and thus the parallel lines can be used for observing the needle in a state of vibration; and, one of them being adopted as standard, the lines can be used for reference to the graduated circle (to be mentioned). All this requires that there be an eye-glass also for the microscope.

The axis of which we have spoken is continued through the graduated glass-plate, and there it carries another transverse arm parallel to the former, and generally similar to it, in which are fixed three sockets and eye-glasses. Thus, reckoning from the observer's eye, there are the following parts:—

(1.) The eye-glass.

(2.) The graduated glass-plate (its graduations, however, not intervening in this part of the glass, the graduated circle being so large as to include, within its circumference, all the microscopes).

(3.) The field-glass, on the further surface of which the parallel lines are engraved.

(4.) The object-glass.

(5.) The needle.

(6.) The removeable glass side of the box.

(7.) The illuminating reflector, to be described hereafter.

The optical part of the apparatus being thus described, we may proceed to speak of the graduated circle.

The graduations of the circle (whose diameter is about $9\frac{3}{4}$ inches) are etched on the inner surface of the graduated glass-plate. These divisions (as well as the parallel lines on the field glasses of the microscopes) are beautifully neat and regular, and are, I think, superior to any that I have seen on metal. The same piece of metal, which carries the transverse arms supporting the microscope bodies, carries also two arms with verniers for reading their graduations. These verniers (being adapted to transmitted light) are thin plates of metal, with notches instead of lines. The reading of the verniers is very easy. The portion of the axis which is external to the graduated glass-plate (towards the observer), and which has there, as already stated, two arms for carrying the microscope eye-glasses, has also two arms for carrying the lenses by which the verniers and glass-plate graduations are viewed. These four arms are the radii of a circle, which can be fixed in position by a clamp, attached to the gun-metal casing of the graduated glass-plate, and furnished with the usual slow-motion screw.

The entire system of the two arms carrying the microscope-bodies, the two arms carrying the microscope eye-glasses, the two arms carrying the verniers, and the two arms carrying the reading-glasses for the verniers, is turned rapidly by means of a button on the external side of the graduated glass-plate, or is moved slowly by means of the slow-motion screw just mentioned.

It now remains only to describe the illuminating apparatus. On the outside of the removeable glass plate, there are supports for the axis of a metallic circle turning in a plane parallel to the plane of needle-vibration. This circle has four slotted radii, which support eight small frames carrying prismatic glass reflectors, each of which can turn on an axis that is in the plane of the circle but transverse to the radius. Two of these reflectors are for the purpose of sending light through the verniers, and therefore are fixed at the same radial distance as the verniers; the other six are intended for sending light past the ends of the needles through the six microscopes, and are therefore fixed at distances corresponding to the fixed microscopes. The circle was originally turned by a small winch near the observer's hand;

at present, the winch is removed, as its axis was found to be slightly magnetic. At each observation, it is necessary to turn the circle which carries the reflectors; but this is the work of an instant.

The light which illuminates the whole is a gas-burner, in the line of the axis of rotation. Its rays fall upon the glass prisms, each of which, turning on its axis, can be adjusted so as to throw the reflected light in the required direction.

The whole of the apparatus, as thus described, is planted upon a horizontal plate admitting of rotation in azimuth: the plate is graduated in azimuth, and verniers are fixed to the gun-metal tripod stand. The gas-pipe is led down the central vertical axis, and there communicates by a rotatory joint with the fixed gas-pipes.

The needles adapted for use with this instrument are—

B_1, a plain needle............	each 9 inches long.
B_2, a plain needle............	
B_3, a loaded needle with adjustible load	
B_4, a needle whose plane passes through the axis of the needle	
C_1, a plain needle............	each 6 inches long.
C_2, a plain needle............	
C_3, a loaded needle with adjustible load	
C_4, a needle whose plane passes through the axis of the needle	
D_1, a plain needle............	each 3 inches long.
D_2, a plain needle............	
D_3, a loaded needle with adjustible load	
D_4, a needle whose plane passes through the axis of the needle	

The needles constantly employed are B_1, C_1, D_1, B_2, C_2, D_2.

In discussing carefully the observations taken with this instrument (as well as with other dip-instruments), great trouble was sometimes experienced in determining the zenith-point (or reading of the vertical circle when the points of the needle are in the same vertical). To remedy this, a "zenith-point-needle" was constructed under my instructions by Mr. Simms; and it has since been used as need required. It is a flat bar of brass; with pivots similar to those of the dip-needles; and with three pairs of points corresponding to the three lengths of needles used; loaded at one end so as to take a position perfectly definite with respect to the direction of gravity; observed with the microscopes, and reversed for another observation, exactly as the dip-needles. For each of the different lengths of dip-needles, the zenith-point is determined by observation of that pair of points of the zenith-point-needle whose interval is the same as the length of the dip-needle.

The instrument carries two levels, one parallel to the plane of the vertical circle, the other at right angles to that plane, by means of which the instrument is from time to time adjusted in level. The readings of the first-mentioned level have for some years (since 1867) been recorded at each separate observation of dip, and since the beginning of the year 1875, these observed readings have been regularly

employed to correct the apparent value of dip for the small outstanding error of level. The instrument is maintained so nearly level that the correction usually amounts to a few seconds of arc only. During the observation on 1877, August 21, the level was accidentally broken: a new level was inserted in the same carrier before the observation of 1877, August 22.

The Dip Instrument and all the needles are examined, at the close of each year, and at other times if thought desirable, by Mr. Dover.

§ 10. *Observations for the absolute Measure of the Horizontal Force of Terrestrial Magnetism.*

In the spring of 1861, a Unifilar Instrument, similar to those used in and issued by the Kew Observatory, was procured by the courteous application of General Sir Edward Sabine, from the makers, Messrs. J. T. Gibson and Son; and after having been subjected to the usual examinations, at the Kew Observatory, for determination of its constants (for which I am indebted to the kindness of Professor Balfour Stewart), was mounted at the Royal Observatory. Observations with this instrument were commenced on 1861, June 11, and the instrument is still in use.

The deflected magnet (whose use is merely to ascertain the proportion which the power of the deflecting magnet at a given distance bears to the power of terrestrial magnetism) is 3 inches long, carrying a small plane mirror. The deflecting magnet is 4 inches long; it is a hollow cylinder, carrying in its internal tube a collimator, by means of which its time of vibration is observed in another apparatus. The frame which supports the suspension-piece of the deflected magnet carries also the telescope directed to the magnet-mirror; it rotates round the vertical axis of a horizontal graduated circle whose external diameter is 10 inches. The deflecting magnet is always placed on the E. or W. side of the deflected magnet, with one end towards the deflected magnet. In the reduction of the observations, the precepts contained in the skeleton form prepared at the Kew Observatory have received the strictest attention.

The following is the explanation of the method of reduction.

The distance of the centers of the deflected and deflecting magnet being known, it is found (from observations made at Kew) that the magnetism of the deflecting magnet is so altered by induction that the following multipliers of its magnetic moment ought to be used in computing the Absolute Force:—

At distance 1·0 foot, factor is	1·00031
1·1	1·00023
1·2	1·00018
1·3	1·00014
1·4	1·00011
1·5	1·00009

The correction of the magnetic power for temperature t_0 of Fahrenheit, reducing all to 35° of Fahrenheit, is

$$0 \cdot 00013126\,(t_0-35) + 0 \cdot 000000259\,(t_0-35)^2$$

A_1 is $\frac{1}{2}$ (distance)^3 × sine deflection, corrected by the two last-mentioned quantities, for distance 1 foot; A_2 is the similar expression for distance 1·3 foot; A'_2 is $\frac{A_2}{(1 \cdot 3)^2}$; P is $\frac{A_1 - A_2}{A_1 - A'_2}$. A mean value of P is adopted from various observations; then m being the magnetic moment of the deflecting magnet, and X the Horizontal component of the Earth's magnetic force, we have $\frac{m}{X} = A_1 \times \left(1 - \frac{P}{1}\right)$ for smaller distance, or $= A_2 \times \left(1 - \frac{P}{1 \cdot 69}\right)$ for larger distance. The mean of these is adopted for the true value of $\frac{m}{X}$.

For computing the value of mX from observed vibrations, it is necessary to know K, the moment of inertia of the magnet as mounted. The value of log. $\pi^2 K$ furnished by Professor Stewart is 1·66073 at temperature 30°, and 1·66109 at temperature 90°. Then putting T for the time of the magnet's vibration as corrected for induction, temperature, and torsion-force, the value of mX is $= \frac{\pi^2 K}{T^2}$. From the combination of this value of mX with the former value of $\frac{m}{X}$, m and X are immediately found. In the year 1878, a new and entirely independent determination of the value of K was made. It very satisfactorily confirmed the adopted value.

It appears, from a comparison of observations given in the Introduction to the *Magnetical and Meteorological Observations*, 1862, that the determinations with the Old Instrument (in use to 1861) ought to be diminished by $\frac{1}{117}$ part, to make them comparable with those of the Kew Unifilar.

The computation of the values of m and X was, to the year 1857, made in reference to English measure only, using the foot and the grain as the units of length and weight; but, for comparison with foreign observations of the Absolute Intensity of Magnetism, it is desirable that X should be expressed also in reference to Metric measure, in terms of the millimètre and milligramme. If an English foot be supposed equal to α times the millimètre, and a grain be equal to β times the milligramme, then it is seen that, for the reduction of $\frac{m}{X}$ and mX to Metric measure, these must be multiplied by α^3 and $\alpha^2\beta$ respectively. Hence X^2 must be multiplied by $\frac{\beta}{\alpha}$, and X by $\sqrt{\frac{\beta}{\alpha}}$. Assuming that the mètre is equal to 39·37079 inches, and the gramme equal to 15·43249 grains, log. $\sqrt{\frac{\beta}{\alpha}}$ will be found to be $= 9 \cdot 6637805$, and the factor for reducing the English values of X to Metric values will be 0·46108 or $\frac{1}{2 \cdot 1689}$. The

values of X in Metric measure thus derived from those in English measure are given in the proper table. The value of X is sometimes required in terms of the centimètre and gramme, commonly known as the C. G. S. unit (centimètre-gramme-second unit), and values in terms of this unit are obtained by dividing those referred to the millimètre and milligramme by 10.

§ 11. *Explanation of the Tables of Results of the Magnetical Observations.*

The results contained in this section (so far as relates to the three magnetometers) are founded upon or derived entirely from the measures of the ordinates of the Photographic Curves, and refer to the astronomical day.

Telescope observations of the magnetometers have usually been made four times every day, except on Sunday, on which day three observations have usually been taken. These observations have been employed for forming values of the base lines on the photographic sheets. Finally a new base line, representing a convenient reading in round numbers of the element to which it applies, has been then drawn on each sheet for convenience of further treatment.

Before further discussing the records, the first step usually taken is to divide the days of observation into two groups; in one of which the magnetism was generally so tranquil that it appeared proper to use those days for determination of the laws of diurnal inequality; while in the other group the movements of the magnetic instruments were so violent, and the photographic curves traced by them so irregular, that it appeared impossible to employ them, except by the exhibition of every motion of the magnet during the day. A similar division into groups had been made in two Memoirs printed in the *Philosophical Transactions*. For the year 1877, however, no days have been found exhibiting sufficient irregularity to render separation necessary.

The whole of the photographic sheets for the year were therefore treated in the following way:—Through each photographic curve a pencil line was drawn, representing, as well as could be judged, the general form of the curve without its petty irregularities. These pencil curves only were then used; and their ordinates were measured, with the proper pasteboard scales, at every hour. These measures being entered in a form having double argument, the vertical argument ranging through the 24 hours of the astronomical day, and the horizontal argument through the days of a calendar month, the means of the numbers standing in the vertical columns give the mean daily value of the element, and the means of the numbers in the horizontal columns the mean monthly value at each hour of the day.

The temperature of the magnetometers was maintained in so great uniformity through each day that the final determination of the diurnal inequalities of horizontal and vertical force should possess great exactitude, although, in regard to vertical

force, the magnitude of the temperature co-efficient introduces an element of some uncertainty. It was, however, impossible to maintain similar uniformity of temperature through all the seasons. Following the general principle adopted in recent years, the results are given uncorrected for temperature; corresponding tables of mean temperature being now in all cases added. It is deemed best that, in the yearly volumes, the results should be thus given, as more easily admitting of independent examination. When, as is done from time to time, the results for series of years are collected for general discussion, the temperature corrections are duly taken into account.

It has been the custom, in preceding volumes, to exhibit the varying Declination in the sexagesimal divisions of the circle, and the variable parts of the Horizontal Force and the Vertical Force, in terms of the whole Horizontal Force and whole Vertical Force respectively. This custom is still retained; but since the year 1872 an addition has been made, carrying out the principle suggested by C. Chambers, Esq., Superintendent of the Bombay Observatory, that all the variable inequalities should be expressed in terms of Gauss's Magnetic Unit. In applying this principle, I have adopted the reference to metrical units of measure and weight instead of British units; a change from the first proposal, which, I believe, has received the assent of Mr. Chambers. The formulæ for converting the original numbers into the new numbers are the following:—

$$\frac{\text{Variations of H. F. in metrical measure}}{\text{H. F. in metrical measure}} = \frac{\text{Variation in former measure}}{\text{Whole value in former measure}}$$

from which,

$$\text{Variation of H. F. metrical} = \frac{\text{H. F. metrical}}{\text{Former H. F.}} \times \text{former variation.}$$

The mean value, for the year, of $\frac{\text{H. F. metrical}}{\text{Former H. F.}} = 1{\cdot}7985$; and this therefore is the factor to be employed for transformation.

Similarly,

$$\text{Variation of V. F. metrical} = \frac{\text{V. F. metrical}}{\text{Former V. F.}} \times \text{former variation.}$$

The Former V. F. (in the same manner as Former H. F.) = 1; but the V. F. metrical = H. F. metrical × tan. dip. The factor is therefore 1·7985 × tan. 67°. 39′. 47″* = 4·3772.

The values given in Tables VIII. and XIII. for the adopted zeros (in metrical units) of the variable forces, are formed by multiplying 0·8600 and 0·9600 (the adopted zeros in the former expressions) by these factors respectively.

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* Strictly the value of Dip should have been 67°. 39′. 38″, but the difference is insignificant.

For Variation of Declination, expressed in minutes, the metrical factor is $1{\cdot}7985 \times \sin. 1' = 0{\cdot}0005232$.

The measures as referred to the metrical unit (millimètre-milligramme-second), are converted into measures on the centimètre-gramme-second (C. G. S.) system by dividing by 10.

In preceding years, allusion has been made to the occasional dislocations of the curve of Vertical Force. Only one such dislocation occurred during the year 1877.

On examining the monthly values of Vertical Force in each year since the mounting of the Vertical Force Magnet which has been used since 1865, it is remarked that the value for each December is less than that for the preceding January by about $\frac{1}{100}$ part of the whole: a quantity far greater than the change deduced from the combination of Dip and Absolute Horizontal Force. This is undoubtedly caused by gradual diminution of the power of the magnet: its determination is supported by the increase in the time of horizontal vibration.

In the Tables of Results of Observations of the Magnetic Dip, the result of each separate observation of Dip with each of the six needles in ordinary use is given, and also the concluded monthly and yearly values for each needle.

The table giving the results of the observations for Absolute Measure of Horizontal Force requires no particular explanation.

§ 12. *Wires and Photographic self-registering Apparatus for continuous Record of Spontaneous Terrestrial Galvanic Currents.*

In order to obtain an exhibition of the spontaneous galvanic currents which in some measure are almost always discoverable in the earth, and which occasionally are very powerful, it was necessary to extend two insulated wires from an earth connexion at the Royal Observatory, in two directions nearly at right angles to each other, to considerable distances, where they would again make connexion with the earth. By the kindness of the Directors of the South Eastern Railway Company, to whom the Royal Observatory has on several occasions been deeply indebted, two connexions were made; one to a station near Dartford, at the direct distance $9\frac{3}{4}$ miles nearly, in azimuth (measured from North, to East, South, West) 102° astronomical or 122° magnetical, the length of the connecting wire being about $15\frac{2}{3}$ miles; the other to a station near Croydon, at the direct distance 8 miles, in azimuth 209° astronomical, or 229° magnetical, the length of the connecting wire being about $10\frac{1}{2}$ miles. At these two stations connexion was made with earth. The details of the courses were as follows. The wires were soldered to a water pipe in the Magnetic Ground at the Royal Observatory. Thence they entered the Magnetic Basement, and passed through

the coils of the galvanometers of the photographic self-registering apparatus (to be shortly described). They were then led up the electrometer mast to a height exceeding 50 feet, and thence swung across the grounds to a chimney above the Octagon Room. They descended thence, and were led to a terminal board in the Astronomical Computing Room, to which an intermediate galvanometer could be attached for eye-observation of the currents. From this point they were led to the "Battery Basement," and, with other wires, passed under the Park to the Greenwich Railway Station, and thence upon the telegraph poles of the South Eastern Railway. One wire branched off at the junction with the North Kent Railway to Dartford, the other at the junction with the main line of railway to Croydon. At both places their connexion with earth was made by soldering to water-pipes, as at the Royal Observatory.

These wires remained in the places described till the end of 1867. It had been discovered in experience that a much smaller separation of the extreme points of earth-connexion would suffice, and it was conjectured that advantage might arise from making the two earth-connexions of each wire on opposite sides of the Observatory and nearly equidistant from it, instead of making one earth-connexion of each within the Observatory grounds. In 1868, therefore, the following wire-courses were substituted. One wire is connected with earth, by a copper plate, at the Lady Well station of the Mid-Kent Railway; it is thence led to the North Kent Junction with the Greenwich Railway, to the Royal Observatory (for communication with the self-registering apparatus), back to the North Kent Junction, then by North Kent Railway and Angerstein Branch to the Angerstein Wharf, where it is connected with earth by a copper plate. The other wire is connected with earth by a copper plate at the North Kent Junction, then passes to the Royal Observatory and back to the Junction, and then along the North Kent Railway to the Morden College end of the Blackheath Tunnel, where it is connected with earth in the same manner. The straight lines connecting the extreme points of the wires cross each other near the middle of their lengths and near the Royal Observatory; the length of the first line is nearly 3 miles, and its azimuth 56° N. to E. (magnetic); that of the second line is nearly $2\frac{1}{2}$ miles, and its azimuth 136°. But, in the circuitous courses above described, the length of the first wire is about $10\frac{3}{4}$ miles, and that of the second $6\frac{1}{4}$ miles. These wires were established and brought into use on 1868, August 20. On 1877, September 19, the route of two of the branches was changed. The Angerstein Wharf and Blackheath branches, instead of passing from Greenwich viâ North Kent Junction, now pass along the new railway line through Greenwich, and thence respectively to Angerstein's Wharf and Blackheath. The length of the section "Lady Well—Angerstein Wharf" is now about $7\frac{1}{2}$ miles, and that of the section "North Kent Junction—Blackheath" about 5 miles. The names and connexions of the Observatory ends of the four branches were identified in 1870; in 1871, June; again in 1872; on 1873, April 17; on 1874, April 15; 1875, May 6;

and 1877, May 15. These were again identified on 1877, October 29, in consequence of the change of route made on 1877, September 19.

The apparatus for receiving the effects of the galvanic currents consists essentially of two magnetic needles (one for each wire), each suspended by a hair so as to vibrate horizontally within a double galvanic coil, exactly as in an ordinary galvanometer (supposed to be laid horizontally); these coils being respectively in the courses of the two long wires. The number of folds of the wire in each coil was 150 (or 300 in the double coil of each instrument) throughout the year. A current of one kind, in either wire, causes the corresponding needle to turn itself through an angle nearly proportioned to the strength of the current, in one direction; a current of the opposite kind causes it to turn in the opposite direction. These turnings are registered by the following apparatus.

To the carrier of each magnet is fixed a small plane mirror, which receives all the azimuthal motions of the magnet. The light of a gas-lamp passes through a minute aperture, and shines upon the mirror; the divergent pencil is converted into a convergent pencil by refraction through crossed cylindrical lenses (with axes vertical before the pencil reaches the mirror, and with axes horizontal where the pencil is received from the mirror), which, under the circumstances, were more convenient than spherical lenses. A spot of light is thus formed upon the photographic paper wrapped upon a cylinder of ebonite, which is covered by a glass cylinder, and made to rotate in twenty-four hours by clock-work, exactly as for the register of the magnetic elements. As in the case of declination and horizontal-force, the two earth currents make their registers upon opposite sides of the same barrel, and upon different parts of the sheet; the same gaslight serving for the illumination of both.

A portion of a zero-line for either record is obtained at any time by simply breaking the galvanic communication.

The photograph records were regularly made, with the wires in the first position, from 1865, March 15, to the end of 1867. Fifty-three days, on which the magnetic disturbances were active, were selected for special examination; and for these the equivalent galvanic currents in the north and west directions were computed, and their effects in producing apparent magnetic disturbances in the west and north directions were inferred. They correspond almost exactly with those indicated by the magnetometers. Then the records for all the days of tranquil magnetism were reduced in the same manner, not for comparison with the magnetometer-results, but for ascertaining the diurnal laws of the galvanic currents. These laws were found to be very different from the laws of magnetic diurnal inequalities. These discussions have been communicated to the Royal Society in two papers, printed respectively in the *Philosophical Transactions* for 1868 and 1870.

The records with the earth connexions in the new positions have been regularly made since 1868, August 20, but have not yet been discussed.

§ 13. *Standard Barometer.*

The Barometer is a standard, by Newman, mounted in 1840. It is fixed on the South wall of the West arm of the Magnetic Observatory. The tube is $0^{in}\cdot565$ in diameter; the cistern is of glass. The graduated scale which measures the height of the mercury is made of brass, and to it is affixed a brass rod, passing down the inside of one of the upright supports, and terminating in a conical point of ivory; this point in observation is made just to touch the surface of the mercury in the cistern, and the contact is easily seen by the reflected and the actual point appearing *just* to meet each other. The rod and scale are made to slide up and down by means of a slow-motion screw. The scale is divided to $0^{in}\cdot05$.

The vernier subdivides the scale divisions to $0^{in}\cdot002$; it is moved by a slow-motion screw, and in observation is adjusted so that the ray of light, passing under the back and front of the semi-cylindrical plate carried by the vernier, is a tangent to the highest part of the convex surface of the mercury in the tube.

At the bottom of the instrument are three screws, turning in the fixed part of the support, and acting on the piece in which the lower pivot of the barometer-frame turns, for adjustment to verticality: this adjustment is examined occasionally.

The readings of this barometer, until 1866, August $20^d. 0^h$, are considered to be coincident with those of the Royal Society's flint-glass standard barometer. On that day a change was made in the barometer. It had been remarked that the slow-motion-screw at the bottom of the sliding rod (for adjusting the ivory point to the surface of the mercury in the cistern) was partly worn away: and on August 20 the sliding rod was removed from the barometer by Mr. Zambra to remedy this defect. It was restored on 1866, August $30^d. 3^h$. Before the removal of the sliding rod, barometric comparisons had been made with a standard barometer the property of Messrs. Murray and Heath, and with two barometers, Negretti and Zambra, Nos. 646 and 647. While the sliding rod of the Greenwich standard was removed, Negretti and Zambra 647 was used for daily observations. After the new equipment of the standard barometer, another series of comparisons with the same barometers was made: from which it was found (the three auxiliaries giving accordant results) that the readings of the barometer, in its new state, required a correction of $-0^{in}\cdot006$. This correction has been applied to every observation commencing with that at 1866, August $30^d. 9^h$.

In the spring of the year 1877 an elaborate comparison of the Standard Barometers of the Greenwich and Kew Observatories was made under the direction of the Kew Committee. (See *Proceedings of the Royal Society*, vol. 27, page 76.) Mr. Whipple, Superintendent of the Kew Observatory, brought four barometers to Greenwich on

three separate occasions. The result of a large number of comparisons showed that the difference between the Greenwich and Kew standards does not exceed 0·001 inch. In this is of course included the above-mentioned correction of $-0^{\text{in}}\cdot006$.

The height of the cistern above the mean level of the sea is 159 feet. This element is founded upon the determination of Mr. Lloyd, in the *Philosophical Transactions*, 1831; the elevation of the cistern above the brass piece inserted in a stone in the transit-room, now the Astronomer Royal's official room, (to which Mr. Lloyd refers,) being $5^{\text{ft}}.\ 2^{\text{in}}$.

The barometer has usually been read at 21^{h}, 0^{h}, 3^{h}, 9^{h} (astronomical), and corrected by application of the index error given above. Every reading has been reduced to the reading which would have been obtained at the temperature 32° of the mercury, and corrected for expansion of the brass scale, by application of the correction given in Table II. (pages 82 to 87) of the Report of the Committee of Physics of the Royal Society. For immediate use the mean of the reduced readings has then been taken for each civil day, and finally converted into mean daily reading, by application of the correction inferred from Mr. Glaisher's paper in the *Philosophical Transactions*, 1848, Part I, Table I, page 127. These results do not appear in the present volume. Instead of them there are results deduced from the photographic records, as will be further on mentioned (in § 26).

In the printed record of the barometrical and all other meteorological observations, the day is to be understood, generally, as defined in civil reckoning.

§ 14. *Photographic self-registering Apparatus for continuous Record of the Readings of the Barometer.*

The Photographic self-registering Apparatus for continuous Record of Magnetic Vertical Force is furnished (as has been stated) with a vertical cylinder covered with photographic paper and revolving in 24 hours. North of the surface of this cylinder, at the distance of about 30 inches, is a large syphon barometer, the bore of the upper and lower extremities of its arms being about 1·1 inch. A glass float partly immersed in the mercury of the lower extremity is partially supported by a counterpoise acting on a light lever, leaving a definite part of the weight of the float to be supported by the mercury. This lever is lengthened to carry a vertical plate of opaque mica having a small horizontal slit, whose distance from the fulcrum is nearly eight times the distance of the point of attachment of the float wire, and whose movement, therefore, is nearly four times the movement of the column of a cistern-barometer. Through this slit the light of a lamp, collected by a cylindrical lens, shines upon the photographic paper. The barometer being supported at its

lower end, the height of the column of mercury in its lower tube on which the record depends is very slightly influenced by changes of temperature.

The scale of time is established by means of occasional interruptions of the light, and the scale of measure is established by comparison with occasional eye-observations.

This barometer was brought into use in 1848, but its indications were not satisfactory till the mercury was boiled in the tube by Messrs. Negretti and Zambra on 1853, August 18, since which time they have appeared unexceptionable.

A discussion of the photographic records of the Barometer from 1854 to 1873 is published in the "Reduction of Greenwich Meteorological Observations, 1847–1873."

§ 15. *Thermometers for ordinary Observation of the Temperature of the Air and of Evaporation.*

The Dry-Bulb Thermometer, the Wet-Bulb Thermometer, the Maximum Self-Registering Thermometers, both dry and wet, and the Minimum Self-Registering Thermometers, dry and wet, all for determination of the temperature of the air and of evaporation, are mounted on a revolving frame whose fixed vertical axis is planted in the ground. From the year 1846 to 1863 the post forming the vertical axis was about 23 feet south (astronomical) of the S.W. angle of the south arm of the Magnetic Observatory; in 1863 it was moved to its present position, about 35 feet south (astronomical) of the S.W. angle. A frame revolves on this post, consisting of a horizontal board as base, of a vertical board projecting upwards from it connected with one edge of the horizontal board, and of two parallel inclined boards (separated about three inches) connected at the top with the vertical board, and at the bottom with the other edge of the horizontal board. The outer inclined board is covered with zinc. The air passes freely between all these boards.

The dry and wet-bulb thermometers are attached to the outside, and near the center of the vertical board; their bulbs are about 4 feet above the ground and projecting from 2 inches to 3 inches below the horizontal board. The maximum and minimum thermometers for air are placed towards one vertical edge, and those for evaporation towards the other vertical edge, with their bulbs at almost the same level, and near to those of the dry and wet-bulb thermometers. Above the thermometers is a small projecting roof to protect them from rain. The frame is always turned with the inclined side towards the sun. It is presumed that the thermometers are thus sufficiently protected.

The graduations of all the thermometers used in the Royal Observatory since the year 1840 rest fundamentally upon those of a Standard Thermometer, the property of Mr. Glaisher, which derives its authority from comparison with original thermo-

meters constructed by the late Rev. R. Sheepshanks about the years 1840–1843, in the course of his preparations for the construction of the National Standard of Length. The whole of the radical determinations of Freezing Point, Boiling Point, and Subdivision of Volume of Tube, were made by Mr. Sheepshanks with the utmost care: it is believed that these were the first original thermometers that had been constructed in England for many years. This thermometer continued to be the standard of reference until June of the year 1875.

By the kindness of the Kew Committee of the Royal Society, a new Kew Standard Thermometer, No. 515, was, in the year 1875, supplied to the Royal Observatory; and, commencing with the month of July of that year, all thermometers have been compared with the new standard, which will hereafter be referred to as the R. O. standard.

In order to determine whether any sensible difference exists between the indications of Mr. Glaisher's standard and those of the R. O. standard, the errors of all thermometers that, in the year 1875, had been recently referred to both standards, were collected for comparison. The details of this comparison will be found in the Introduction to the Magnetical and Meteorological Observations for 1875, page *xlviii*. The result arrived at was that the standards were practically identical.

The Dry-Bulb and Wet-Bulb thermometers are by Horne and Thornthwaite. The readings of the dry-bulb thermometer require a subtractive correction of 1°·0; those of the wet-bulb thermometer require corrections as follows:—

Below	55°	subtract 0°·9
Between	55° and 70	0·7
Above	70	0·5

The self-registering thermometers for temperature of air and evaporation are by Negretti and Zambra. The construction of the thermometers for maximum temperature is as follows.

There is a small detached piece of glass in the tube, at the bent part (near the bulb), through which the piece of glass cannot pass down. The column of mercury in rising is forced through the contraction produced by the piece of glass; but in falling it is unable to pass the glass, and the lower mass of mercury descends into the bulb, leaving a vacant space below the glass, and a portion of the mercury above it. The piece of glass operates as an efficient valve. The thermometer used for maximum temperature of the air was No. 8527; its corrections were:—

Below	40°	subtract 0°·7
Above	40	0·8

The maximum wet bulb thermometer was No. 1575. Its corrections were as follows:—

Below	35°	....	0°·0
Between	35 and 40	subtract	0·1
	40 and 43	....	0·2
Above	43	....	0·3

The minimum self-registering thermometers by Negretti and Zambra are alcohol thermometers (on Rutherford's principle). A sliding glass index allows the alcohol in rising to pass above it, but is drawn down by the peculiar action of the bounding surface of the fluid when it sinks. The readings of that for minimum temperature of the air, No. 4386, required a subtractive correction of 0°·5. The minimum wet-bulb, No. 3627, required an additive correction of 0°·3.

The eye-readings of the dry-bulb and wet-bulb thermometers have usually been taken at the hours (astronomical reckoning) 21^h, 0^h, 3^h, 9^h, and corrected by application of the index errors already given. For immediate use the means of the corrected readings of the dry bulb and wet bulb thermometers have been taken and converted into mean daily readings, by the application of corrections derived from Mr. Glaisher's paper before mentioned, but the results do not appear in this volume, the photographic records being now employed, as will be further on explained (in § 26).

§ 16. *Photographic self-registering Apparatus for continuous Record of the Readings of the Dry-Bulb and Wet-Bulb Thermometers.*

About 28 feet south (magnetic) of the south-east angle of the south arm of the Magnetic Observatory, and about 25 feet east of the thermometers for eye-observations, is an open shed 10 ft. 6 in. square, standing upon posts 8 feet high, under which are placed the photographic thermometers, the dry-bulb thermometer towards the east, and the wet-bulb thermometer towards the west. The bulbs of the thermometers are 8 inches in length, and 0·4 inch internal bore, and their centers are about 4 feet above the ground. The bulb of the thermometer employed as wet-bulb is covered with muslin throughout its whole length, which is kept moist by means of capillary passage of water along cotton wicks leading from a vessel filled with water.

There are small adjustments admitting the raising or dropping of the thermometers, so that the register of their changing readings may fall on a convenient part of the paper. The thermometer frames are covered by plates having longitudinal apertures, so narrow, that any light which may pass through them is completely, or

almost completely, intercepted by the broad flat column of mercury in the thermometer-tube. Across these plates a fine wire is placed at every degree; those at the decades of degrees, and also those at 32°, 52°, and 72°, being coarser than the others. A gas lamp is placed about 9 inches from each thermometer (east of the dry bulb and west of the wet bulb), and its light, condensed by a cylindrical lens, whose axis is vertical, shines through the thermometer-tube above the surface of the mercury, and forms a well-defined line of light upon the photographic paper, which is wrapped around the cylinder. The axis of this cylinder is vertical; its mounting is in all respects similar to that of the Vertical Force cylinder. As the cylinder, covered with photographic paper, revolves under the light, which passes through the thermometer-tube, it receives a broad sheet of photographic trace, whose breadth (in the direction of the axis of the cylinder) varies with the varying height of the mercury in the thermometer-tube. Parts of the light in its passage are intercepted by the wires placed across the tube at every degree, and there are, therefore, left upon the paper corresponding lines in which there is no photogenic action.

The cylinder was at first made to revolve in 48 hours; the daily photographic traces of the two thermometers were thus simultaneously registered on opposite sides of the cylinder, sometimes slightly intermixing. The length of the glass cylinder used till 1869, March, is $13\frac{1}{2}$ inches, and its circumference is about 19 inches. On 1869, March 5, an ebonite cylinder was introduced, whose length is 10 inches, and circumference about 19 inches; and at a later time the cylinder was made to revolve in 50 hours instead of 48 hours, to insure the separation of the records of the two thermometers.

The photographic records of the dry-bulb and wet-bulb thermometers have been discussed from 1848 to 1868. The results exhibit the diurnal inequality of the temperature of the air and of evaporation, as grouped by months, as grouped by periods of high and low temperature, as grouped by periods of high and low atmospheric pressure, as grouped by cloudless or overcast sky, and as grouped by directions of the wind. They are published in the "Reduction of Greenwich Meteorological Observations, 1847–1873."

§ 17. *Thermometers for Solar Radiation and Radiation to the Sky.*

The thermometer for Solar Radiation, which to the end of the year 1864 was placed in an open box about 10 feet south of the south-west angle of the south arm of the Magnetic Observatory, is now laid on the grass, near the same place.

The thermometer is a self-registering maximum mercurial thermometer of Negretti and Zambra's construction (No. 5964); its bulb is blackened, and enclosed in a glass sphere from which the air has been exhausted. Its graduations are correct, and the

numbers inserted in the tables are those read from the instrument without alteration. The thermometer is read at 21^h, 0^h, 3^h, and 9^h daily; the highest of these readings is adopted as the maximum for the day.

The use of a thermometer with blackened bulb not inclosed in an exhausted sphere was discontinued at the end of 1865.

The thermometer for radiation to the sky is placed near to the Solar Radiation thermometer, with its bulb resting on short grass, and fully exposed to the sky. It is a self-registering minimum spirit thermometer of Rutherford's construction, Horne and Thornthwaite, No. 3120. Its graduation is correct, and the numbers inserted in the table are those read from the scale without alteration. It is read every day at 21^h, and occasionally at 9^h.

§ 18. *Thermometers sunk below the Surface of the Soil at different Depths.*

These thermometers were made by Messrs. Adie of Edinburgh, under the immediate superintendence of the late Professor J. D. Forbes. The graduation was made by Professor Forbes himself.

The thermometers are four in number. They are all placed in one hole in the ground, the diameter of which in its upper half is 1 foot, and in its lower half about 6 inches. Each thermometer is attached in its whole length to a slender piece of wood, which is planted in the hole with it. The place of the hole is 20 feet south (magnetic) of the extremity of the south arm of the Magnetic Observatory, and opposite the center of its south front.

The soil consisted of beds of sand; of flint-gravel with a large proportion of sand; and of flints with a small proportion of sand, cemented almost to the consistency of pudding-stone. Every part of the gravel and sand extracted from the hole was perfectly dry.

The bulbs of the thermometers are cylindrical, 10 or 12 inches long and 2 or 3 inches in diameter. The bore of the principal part of the tubes, from the bulb to the graduated scale, is very small. In that part to which the scale is attached, the tube is larger.

The thermometer No. 1 was dropped into the hole to such a depth that the center of its bulb was 24 French feet (25·6 English feet) below the surface: then dry sand was poured in till the hole was filled to nearly half its height. Then No. 2 was dropped in till the center of its bulb was 12 French feet below the surface; No. 3 and No. 4 till the centers of their bulbs were respectively 6 and 3 French feet below the surface; and the hole was then completely filled with dry sand. The upper parts of the tubes, carrying the scales, were left projecting above the surface: No. 1 by 27·5 inches, No. 2 by 28·0 inches, No. 3 by 30·0 inches, and No. 4 by 32·0 inches.

Of these lengths, the parts 8·5, 10·0, 11·0, and 14·5 inches, respectively, are tube with narrow bore.

The projecting parts of the tubes are protected by a wooden case or box fixed to the ground: the sides of the box are perforated with numerous holes, and it has a double roof. In the North face of this box is a large plate of glass through which the thermometers are read. Within the box are two smaller thermometers, one (No. 5) whose bulb is sunk one inch in the ground, and one (No. 6) whose bulb is in the free air nearly in the center of the box.

The fluid of the four long thermometers is alcohol tinged with a red colour.

The lengths of 1° on the scales of Nos. 1, 2, 3 and 4, are respectively about 1·9 inch, 1·1 inch, 0·9 inch, and 0·5 inch: and the ranges of the scales, as first mounted, were, 43°·0 to 52°·7, 42°·0 to 56°·8, 39°·0 to 57°·5, and 34°·2 to 64°·5.

These ranges for Nos. 2, 3, and 4, were found to be insufficient in some years, particularly those of Nos. 3 and 4, or the thermometers sunk to the depth of 6 feet and 3 feet.

In 1857, June 22, Messrs. Negretti and Zambra removed from Nos. 3 and 4 a quantity of fluid corresponding to the extent of 5° on their scales, and the scales of these two thermometers were then lowered by that linear extent, making the readings the same as before.

In subsequent years it was found that the amount of fluid removed was somewhat too great, for at the lower end of the scale the 6-foot thermometer sometimes fell below the limit of its scale or 44°; and the 3-foot thermometer below 39°·0; in which cases the alcohol sank into the capillary tube.

The readings at the early part of the series were at times defective at high temperatures, but always complete at low temperatures; afterwards, they were generally complete at high temperatures, and at times defective at low temperatures. The two combined, however, will enable us to complete all readings.

On 1869, July 21, Mr. Zambra removed fluid from No. 1 to the amount of 2°·7, and from No. 2 to the amount of 1°·5, and inserted in No. 4 fluid to the amount of 1°·5. The scales were re-engraved, to make the reading at every temperature the same as before.

In 1877, May, new porcelain scales were applied to these thermometers, by which the facility of reading is much increased.

The ranges of the scales are now,—for No. 1, 46°·0 to 55°·5; for No. 2, 43°·0 to 58°·0; for No. 3, 44°·0 to 62°·0; and for No. 4, 37°·0 to 68°·0.

These thermometers are read once a day, at noon, and the readings appear in the printed volumes as read from their scales without correction.

The observations of these thermometers from 1846 to 1859 have been elaborately reduced by Professor Everett; the results are printed as an Appendix to the Greenwich Observations for 1860. Abstracts of the observations of these thermometers

(giving mean monthly temperatures) for the period 1847 to 1873 have since been published in the "Reduction of Greenwich Meteorological Observations 1847–1873."

§ 19. *Thermometers immersed in the Water of the Thames.*

The self-registering maximum and minimum thermometers for determining the highest and lowest temperatures of the water of the Thames are observed every day at 9^h a.m.

The thermometers, inclosed in a wooden trunk, were originally attached to the side of the "Dreadnought" hospital ship. Commencing with 1871, January 12, they were attached to the Police Ship "Scorpion," moored in Blackwall Reach. In the month of May 1874, the wooden trunk was shifted from the "Scorpion" to the "Royalist," moored in the same place. The first readings with the thermometers in the last-mentioned position were taken 1874, May 5.

A strong wooden trunk is firmly fixed to the side of the "Royalist," about 5 feet in height, and closed at the bottom; the bottom and the sides, to the height of 3 feet, are perforated with a great number of holes, so that the water can easily flow through; the thermometers are suspended within this trunk so as to be about 2 feet below the surface of the water, and 1 foot from the bottom of the trunk.

The observations have been made by the Resident Inspector on board, by permission of Lieut.-Col. Sir Edmund Y. W. Henderson, R.E., K.C.B., Commissioner of Metropolitan Police.

The thermometer used for maximum temperature (a thermometer on Phillips's principle) is Horne and Thornthwaite, No. 22242; that for minimum temperature is Horne and Thornthwaite, No. 22243. Both thermometers require an additive correction of 0°·3. The omission of the readings from 1877, October 23 to October 26 is due to the "Royalist" having been, during this period, in dry dock for repairs.

§ 20. *Osler's Anemometer.*

This anemometer is self-registering: it was made by Newman, on a plan furnished by A. Follett Osler, Esq., F.R.S., but has received several changes since it was originally constructed. A large vane, which is turned by the wind, and from which a vertical spindle proceeds down nearly to the table in the north-western turret of the ancient part of the Observatory, gives motion by a pinion upon the spindle to a rack-work carrying a pencil. In 1866 the vane-shaft was made to bear upon anti-friction-rollers running in a cup of oil. The pencil makes a mark upon a paper affixed to a

board which is moved uniformly in a direction transverse to the direction of the rack-motion. The movement of the board is effected by means of a second rack connected with the pinion of a clock. The paper has lines printed upon it corresponding to the positions which the pencil must take when the direction of the vane is N., E., S., or W.; and also has transversal lines corresponding to the positions of the pencil at every hour. The first adjustment for azimuth was obtained by observing from a certain point the time of passage of a star behind the vane-shaft, and computing from that observation the azimuth; then on a calm day drawing the vane by a cord to that position, and adjusting the rack, &c., so that the pencil position on the sheet corresponded to that azimuth.

For the pressure of the wind the construction originally arranged by Mr. Osler was in use till the middle of 1866, when the following modifications were made in it by Mr. Browning, for explanation of which I refer to Figure 3 on the engraving at the end of the Introduction to the volume of 1866. To the vane-shaft is attached a rectangular frame C, which rotates with the vane. To this frame are firmly attached the ends of four strong springs D, which rise from the point of attachment in a vertical direction, are then bent so as to descend below the frame C, and are then bent upwards so as to rise a short distance, where they terminate, each of them thus forming a large hook. To the interior of each strong spring, near to its upper bend, is affixed a very weak spring, which descends free into the lower bend or hook of the strong spring, so that its lower end may be moved by a light pressure till it reaches and takes bearing against the bent-up part of the strong spring, after which it cannot be further moved without moving the strong spring, and will therefore require much greater pressure. The four ends of these four light springs carry the circular pressure-plate A by the following connexions. The two which are farthest from A, or which are below the wide part of the vane, are united by a light horizontal cross-bar G; and from the ends of these springs proceed four light bars E, which are attached to points of the pressure-plate A, near its circumference. The two ends of light springs which are nearest to A are also united by a light horizontal cross bar, which is attached to a projection from the center of the plate A. (The diagonal lines upon A, in the diagram, represent indistinctly two strengthening edge-bars upon the pressure-plate, and the projection above mentioned is fixed to their intersection.) The weight of the pressure-plate thus rests entirely on the slender springs; it is held steadily in position, as regards the opposition to the wind, and it moves without sensible friction. A light wind drives it through a considerable space, until the ends of one pair of light springs touch their large hooks; then for every additional pound of pressure the movement is smaller, till the ends of the other pair of light springs touch their large hooks; after this the movement for every additional pound of pressure is still further diminished. This apparatus was arranged by Mr. Browning. The communication

with the pencil below is similar to that in the first construction: the cord and pulley are omitted in the drawing to avoid confusion.

The pressure-pencil below is carried by a radial bar, whose length is parallel to the scale of hours; it is brought to zero by a light spring.

The surface of the pressure-plate is 2 square feet, or double that in the old construction. The scale of indications on the recording sheet was determined experimentally as in the old instrument; yet it was remarked that the pressures of wind per square foot appeared generally greater than formerly. It was suspected that the inertia of the tension-weight acting against the pressure-spring, and that of the pencil-weight, may have produced an injurious effect: both these weights were replaced by springs, 1872, February 21. The pencil-spring has since been removed and weight applied as necessary.

The scale for small pressures is much larger, and their indications much more certain than formerly. A pressure of an ounce per square foot is clearly shown.

A rain gauge of peculiar construction is carried by this instrument, by which the fall of rain is registered with reference to the time of the fall. It is described in § 22.

A fresh sheet of paper is applied to this instrument every day at 22^h mean solar time.

§ 21. *Robinson's Anemometer.*

In the latter part of the year 1866, a new instrument, on the principles described by Dr. Robinson in the *Transactions of the Royal Irish Academy*, vol. xxii., adapted to give a continuous record of the velocity of the wind, was mounted by Mr. Browning, of which the principal parts are represented in Figures 1 and 2 of the engraving in the Introduction 1866. The motion is given (as in the former instrument) by the pressure of the air on four hemispherical cups, the distance of the center of each from the axis of rotation being 15·00 inches. The foot of the axis is a hollow flat cone bearing upon a sharp cone which rises up from the base of a cup of oil. The horizontal arms are connected with a vertical spindle, upon which is an endless screw working in a toothed wheel connected with a train of wheels, furnished with indices capable of registering one mile and decimal multiples of a mile up to 1,000 miles. A pinion C upon the axis of one of the wheels (which, in the figure, occupies a place too high) acts in a rack J, drawing it upwards by the ordinary motion of the revolving cups. The rack is pressed to the pinion by a spring, and, when it has been drawn up, it can be pressed by hand in opposition to the spring so as to release it from the pinion, and can then be pushed down, again to be raised by the action of the wheel-work. The rack is connected at the bottom with a sliding rod D, which passes down into the chamber below, where it draws up the sliding pencil-carrier E. The pencil F, which

it carries, traces its indications upon the sheet of paper wrapped round a barrel, whose axis is vertical, and which by spindle connexion with the clock H is made to revolve in 24 hours. The revolving cups and wheel-work are so adjusted that a motion of the pencil upwards of one inch represents a motion of the air through 100 miles. The curve traced upon the barrel exhibits, therefore, the aggregate of the air's movements, and also the air's velocity, at every instant of the day.

In the year 1860, on July 3, 4, and 13, experiments were made in Greenwich Park, with the instrument then in use, to ascertain the correctness of the theory of Robinson's anemometer; the point to be verified being that the scale of the instrument, founded on the supposition that the horizontal motion of the air is about three times the space described by the centers of the cups, is correct.

A post about 5 feet high with a vertical spindle in the top was erected, and on this spindle turned a horizontal arm, carrying at the extremity of its longer portion Robinson's anemometer, and on its shorter portion a counterpoise. The distance from the vertical spindle of the post to the vertical axis of the anemometer was $17^{\text{ft.}}\ 8^{\text{in.}}\cdot 7$. The reading of the dial was taken, and then the arm was made to revolve in the horizontal plane 50 or 100 times, an attendant counting the number of revolutions, and the reading of the dial was again taken. In this manner 1,000 revolutions were made in the direction N.E.S.W.N., and 1,000 revolutions in the direction N.W.S.E.N. In some of the experiments the air was sensibly quiet, and in others there was a little wind; the result was,

For a movement of the instrument through one mile,

Beam revolving N.E.S.W. (opposite to the direction of rotation of the Anemometer-cups)	1·15 was registered.
Beam revolving N.W.S.E. (in the same direction as the Anemometer-cups)	0·97 was registered.

The results from rapid revolutions and from slow revolutions were sensibly the same.

This may be considered as sufficiently confirming the accuracy of the theory.

§ 22. *Rain Gauges.*

The rain-gauge connected with Osler's anemometer is 50 feet 8 inches above the ground, and 205 feet 6 inches above the mean level of the sea. It exposes to the rain an area of 200 square inches (its horizontal dimensions being 10 by 20 inches).

The collected water passes through a tube into a vessel suspended in a frame by spiral springs, which lengthen as the water accumulates, until 0·25 of an inch is collected in the receiver; it then discharges itself by means of the following modification of the syphon. A copper tube, open at both ends, is fixed in the receiver, in a vertical

position, with its end projecting below the bottom. Over the top of this tube a larger tube, closed at the top, is placed loosely. The smaller tube thus forms the longer leg, and the larger tube the shorter leg, of a syphon. The water, having risen to the top of the smaller tube, gradually falls through it into the uppermost portion of a tumbling bucket, fixed in a globe under the receiver. When full, the bucket falls over, throwing the water into a small pipe at the lower part of the globe; the water completely fills the bore of the pipe; its descent causes an imperfect vacuum in the globe, sufficient to cause a draught in the longer leg of the syphon, and the whole contents run off. After leaving the globe, the water is carried away by a waste-pipe attached to the building. The springs then shorten and raise the receiver. The ascent and descent of the water-vessel move a radius-bar which carries a pencil; and this pencil makes a trace upon the paper carried by the sliding board of the self-registering anemometer. As the trace is rather long in proportion to the length of the radius-bar, the bar has now been furnished by Mr. Browning with a "parallel motion," which makes the motion of the pencil sensibly straight.

The scale on the printed paper was adjusted by repeatedly filling the water-vessel until it emptied itself. The weight of the quantity necessary to cause one discharge being thus determined, its bulk was ascertained, and this bulk being divided by the area of the surface of the rain receiver gave the corresponding measure of the scale.

A second gauge, with an area 77 square inches nearly, is placed close to the preceding, the receiving surface of both being on the same horizontal plane.

A third gauge is placed on the roof of the Octagon room, at 38 feet 4 inches above the ground, and 193 feet 2 inches above the mean level of the sea. It is a simple cylinder gauge, 8 inches in diameter and about $50\frac{1}{4}$ square inches in area. The height of the cylinder is $13\frac{1}{2}$ inches; at the depth of 1 inch from the top within the cylinder is fixed a funnel (an inverted cone) of 6 inches perpendicular height; with the point of this funnel is connected a tube, $\frac{1}{5}$ of an inch in diameter, and $1\frac{1}{2}$ inch in length; $\frac{3}{4}$ of an inch of this tube is slightly curved, and the remaining $\frac{3}{4}$ of an inch is bent upwards, terminating in an aperture of $\frac{1}{8}$ of an inch in diameter. By this arrangement, the last few drops of water remain in the bent part of the tube, and the water is some days evaporating. The upper part of the funnel or bore of the cone is connected with a brass ring, which has been turned in a lathe, and this is connected with a circular piece 6 inches in depth, which passes outside the cylinder, and rests in a water joint, attached to the inner cylinder, and extending all round.

A fourth gauge is placed on the top of the Library; it is a funnel, whose top has a diameter of 6 inches; its exposed area is $28\frac{1}{4}$ square inches nearly. The receiving surface of the gauge is 22 feet 4 inches above the ground, and 177 feet 2 inches above the mean level of the sea.

A fifth gauge is planted on the roof of the Photographic Thermometer shed, 10 feet

above the ground, and 164 feet 10 inches above the mean level of the sea. Its construction is the same as that of the third gauge.

A sixth gauge is a self-registering rain-gauge on Crosley's construction, made by Watkins and Hill. The surface exposed to the rain is 100 square inches. The collected water falls into a vibrating bucket, whose receiving concavity is entirely above the center of motion, and which is divided into two equal parts by a partition whose plane passes through the axis of motion. The pipe from the rain-receiver terminates immediately above the axis. Thus that part of the concavity which is highest is always in the position for receiving water from the pipe. When a certain quantity of water has fallen into it, it preponderates, and, falling, discharges its water into a cistern below; then the other part of the concavity receives the rain, and after a time preponderates. Thus the bucket is kept in a state of vibration. To its axis is attached an anchor with pallets, which acts upon a toothed wheel by a process exactly the reverse of that of a clock-escapement. This wheel communicates motion to a train of wheels, each of which carries a hand upon a dial-plate; and thus inches, tenths, and hundredths are registered. Sometimes, when the escapement has obviously failed, the water which has descended to the lower cistern has again been passed through the gauge, in order to enable an assistant to observe the indication of the dial-plates without fear of an imperfection in the machinery escaping notice. The gauge is placed on the ground, 21 feet South of the Magnetic Observatory, and 156 feet 6 inches above the mean level of the sea.

The seventh and eighth gauges are placed near together, about 16 feet south of the Magnetic Observatory, 5 inches above the ground, and 155 feet 3 inches above the mean level of the sea. They are similar in construction and area to No. 3. These gauges are sunk about 8 inches in the ground.

Another gauge (the ninth) was established at the end of the year 1875 at the Police ship "Royalist." Its receiving surface is 17 feet above the level of the river. It was brought into use on 1876, January 1.

All these gauges, except No. 8, are read at 21^h daily; in addition, Crosley's gauge and No. 7 are read daily at 9^h. No. 8 is read at the end of each month only, to check the summation of the daily readings of No. 7. All are read at midnight of the last day of each month.

§ 23. *Electrical Apparatus.*

The electrical apparatus consists of two parts, namely, the Moveable Apparatus, which is connected with a pole nearly 80 feet high, planted 7 feet North and 2 feet East of the north-east angle of the north arm of the Magnetic Observatory (as

extended in 1862); and the Fixed Apparatus, which is mounted in a projecting window in the ante-room of the Magnetic Observatory.

On the top of the pole is fixed a projecting cap, to which are fastened the ends of two iron rods, which terminate in a pit sunk in the ground, and are kept in tension by attached weights. These rods are to guide the moveable apparatus in its ascents and descents. Near the bottom of the pole is fixed a windlass; the rope upon which it acts passes over a pulley in the cap, and is used to raise the moveable apparatus, which when raised to the top is suspended on a hook.

The moveable apparatus consists of the following parts:—A plank in a nearly vertical position is attached to perforated iron bars, which slide upon the iron rods. On the upper part of this plank is a cubical box. The box incloses a stout pillar of glass, having a conical hollow in its lower part. In the bottom of the box there is a large hole through which a cone of copper passes into the conical hollow of the glass pillar. In the lower part of the box a gas-lamp is placed, by the flame of which the copper cone and the lower part of the glass pillar are kept in a state of warmth. The gas lamp, when accidentally extinguished by the wind or other cause, is relighted by means of a sliding frame, carrying a torch, similar to that of ordinary lamplighters, which can be easily raised to the box; and there are very few losses of electrical indications from the failure of the lamp. A copper wire is fastened round the glass pillar; its end is carried to a similar glass pillar, warmed in the same manner, near the north-western turret of the Octagon room; by this wire, whose length is about 400 feet, the atmospheric electricity is collected. To this wire, near the box, is attached another copper wire (now covered with gutta percha) 0·1 inch in diameter, and about 73 feet long, at the end of which is a hook; a loaded brass lever connected with the fixed apparatus presses upon this hook, and thus keeps the wire in a state of tension, and at the same time establishes the electrical communication between the long horizontal wire and the fixed apparatus.

On 1871, November 17, the box which carries the insulating glass pillar was burnt. It seems possible that this accident was caused by soot deposited during gusty weather, which afterwards caught fire from the lamp. A copper box was substituted for the wooden box on 1872, January 2.

The fixed apparatus consists of these parts:—A glass bar, nearly 3 feet long, and thickest at its middle, is supported in a horizontal position, its ends being fixed in pieces of wood projecting downwards from the roof of the projecting window. Near to each end is placed a small gas-lamp, whose chimney encircles the glass, and whose heat keeps the glass in a state of warmth proper for insulation. A brass collar surrounds the center of the glass bar; it carries one brass rod, projecting vertically upwards through a hole in the roof of the window recess, to which rod are attached a small metallic umbrella and the loaded lever above mentioned; and it carries another rod projecting vertically downwards, to which is attached a horizontal brass

tube in an East and West direction. On the North and South sides of this tube there project four horizontal rods, through the ends of which there pass vertical rods, which can be fixed by screws at any elevation; these are placed in connexion with the electrometers, which rest on the window seat.

The electrometers during the year 1877 consisted of two Volta's Electrometers, denoted by Nos. 1 and 2; a Henley's Electrometer; a Ronald's Spark Measurer; a Dry-pile Apparatus; and a Galvanometer.

Volta 1 and Volta 2 are of the same construction; each is furnished with a pair of straws 2 Paris inches in length; those of the latter being much heavier than those of the former: each instrument is furnished with a graduated ivory scale, whose radius is 2 Paris inches, and it is graduated into half Paris lines. In the original construction of these instruments it was intended that each division of No. 2 should correspond to five of No. 1: the actual relation between them has not been determined by observations at the Royal Observatory. The straws are suspended by hooks of fine copper wire to the suspension-piece, and they are separated by an interval of half a line.

Henley's Electrometer is supported on the West end of the large horizontal tube by means of a vertical rod fixed in it. On each side of the upper part of this rod is affixed a semicircular plate of ivory, whose circumference is graduated; at the centers of these ivory plates two pieces of brass are affixed, which are drilled to receive fine steel pivots, carrying a brass axis, into which the index or pendulum is inserted; the pendulum terminates with a pith ball. The relation between the graduations of this instrument and those of the other electrometers has not been determined. This instrument has seldom been affected till Volta 2 has risen to above 100 divisions of its scale.

The spark measurer consists of a vertical sliding rod terminated by a brass ball, which ball can be brought into contact with one of the vertical rods before referred to, also terminating in a ball; and it can be moved from it or towards it by means of a lever, with a wooden handle. During the operation of separating the balls, an index runs along a graduated scale, and exhibits the distance between the balls, and this distance measures the length of the spark.

The electrometers and the spark measurer were originally constructed under the superintendence of the late Sir Francis Ronalds, but have since received small alterations.

The dry-pile apparatus was made by Watkins and Hill; it is placed in connexion with the brass bar by a system of wires and brass rods. The indicator, which vibrates between the two poles, is a small piece of gold leaf. This instrument is very delicate, and it indicates at once the quality of the electricity. When the inclination of the gold leaf is such that it is directed towards the top of either pile, it remains there as long as the quantity of electricity continues the same or becomes greater: the position is sometimes expressed in the notes by the words "as far as possible."

[illegible]

[illegible]

axis of

of rays

[illegible]

[129*]

Royal Observatory, Greenwich,

London, S.E.

1880.

Sir,

I have the honor to inform you that the publication of the Royal Observatory, mentioned on the next leaf, presented to you by authority of the Lords Commissioners of the Admiralty, have been forwarded by Post

I request the favor of an acknowledgment of receipt.

I have the honor to be,

Sir,

Your very obedient Servant,

A. M. W. Downing

To

[illegible] Esq.

[25006.] 1000.—12 76. Wt. 11028.

The angle which the gold leaf makes with the vertical at this time is about 40°. The action of the dry-pile apparatus was not satisfactory during the year 1877, and its indication of the quality of the electricity was uncertain. In consequence, reference for quality was when possible made to the galvanometer described in the next paragraph.

The galvanometer was made by Gourjon of Paris, and consists of an astatic needle, composed of two large sewing needles, suspended by a split silk fibre, one of the needles of the pair vibrating within a ring formed by 2,400 coils of fine copper wire. The connexions of the two portions of wire forming these 2,400 coils are so arranged that it is possible to use a single system of 1,200 coils of single wire, or a system of 1,200 coils of double wire, or a system of 2,400 coils of single wire: in practice the last has always been used. A small ball communicating by a wire with one end of the coils is placed in contact at pleasure with the electric conductor, and a wire leading from the other end of the coil communicates with the earth. An adjustible circular card, graduated to degrees, is placed immediately below the upper needle; the numeration of its divisions proceeds in both directions from a zero. One of these directions is distinguished by the letter A, and the other by the letter B; and the nature of the indication represented by the deflection of the needle towards A or towards B will be ascertained from the following experiment. A voltaic battery being formed by means of a silver coin and a copper coin, having a piece of blotting paper moistened with saliva between them: when the copper touches the small ball, and the wire which usually communicates with the earth is made to touch the silver, the needle turns towards A; when the silver touches the small ball, and the wire is made to touch the copper, the needle turns towards B.

The glass pillars did not satisfactorily insulate the collecting wire during the present year, and the indications of the instruments were in consequence imperfect. It is intended to supersede them by Thomson's self-recording electrometer, which was supplied, though not brought into a working state, during the present year.

Feb 21 '78

This description might be improved

§ 24. *Instrument for the Registration of Sunshine.*

The instrument with which the record of duration of sunshine is obtained is one contrived by J. F. Campbell, Esq., and kindly placed by him at the service of the Royal Observatory. It consists of a very accurately formed sphere of glass, nearly 4 inches in diameter, supported concentrically within a well turned hemispherical metal bowl in such a manner that ~~the image of the sun, formed~~ when the sun shines, falls always on the concave surface of the bowl. A strip of some suitable material being fixed in the bowl, the ~~sun, when shining, burns~~ away the material at the points at which the image successively falls, by which means the record of periods of sun-

/ one of the images of the Sun formed on the axis of a cone of rays, at a focus, by the spherical lens

/ Sun's rays at the focus burn

shine is obtained. The strip is removed after sunset, and a new one fixed ready for the following day. Until February 26 white cardboard was used; from February 27, the cardboard was blackened with stencilling ink. Commencing with April 10 blackened millboard was used. The register is frequently much interrupted, continuous sunshine through a whole day being a comparatively rare circumstance. The place of the meridian is marked on the strip before removing it from the bowl. A series of time scales, suitable for different periods of the year, having been prepared, the proper scale is selected and placed against the record, which is then easily transferred to a sheet of paper specially ruled with equal vertical spaces to represent hours, each sheet containing the record for one calendar month. The daily sums and sums during each hour through the month are thus readily formed. The instrument gives fairly the duration of sunshine, but (usually) no register is obtained at altitudes of less than 5°. Indeed, on fine days the register, which usually has a certain breadth, tapers off in the early morning and late evening hours to a fine point, thus showing the extent to which registration under the best circumstances is effective. The recorded durations are to be understood as indicating the amount of *bright* sunshine, no register being obtained when the sun shines faintly through fog or cloud.

Registration

Which system was also contributed by [illegible] [illegible] 18th Feb [illegible]

See correspondence with Stainfield about a 'Time lecture' [illegible]

Prof sent to Greenwich to have the Solar register [illegible]

month 8. Profs sent to me at Midday Lodge

See table p. LIV. Continued at the Observatory

§ 25. *Ozonometer.*

The Ozonometer (furnished by Messrs. Horne and Thornthwaite) is fixed on the south-west corner of the roof of the Photographic Thermometer shed, at a height of about 10 feet from the ground. The box in which the papers are exposed is of wood: it is about 8 inches square, and blackened inside, and so constructed that there is free circulation of air through the box, without exposure of the paper to light. The papers are exposed and collected at 21^h, 3^h, and 9^h, and the degree of tint produced is compared with a scale of graduated tints, numbered from 0 to 10. The value of ozone for the civil day is determined by taking the degree of tint obtained at each hour of collection as proportional to the period of exposure. Thus to form the values for any given civil day, three-fourths of the value registered at 21^h, the values registered at 3^h and 9^h, and one-fourth of that registered at the following 21^h, are added together, the resulting sum (which appears in the tables of "Daily Results") being taken as the value referring to the civil day. The mean of the 21^h, 3^h, and 9^h values, as observed, are also given for each month in the foot notes.

§ 26. *Explanation of the Tables of Results of the Meteorological Observations.*

The results contained in this section refer generally to the civil day commencing at midnight.

Royal Observatory, Greenwich,
London, S.E.

1880. February 20

Dear Sir

In regard to sunshine observations we could give you, for a year the daily duration of sunshine with the interval during which the sun was above the horizon would this suit your purpose? It would take a considerable time to prepare a transcript of the special features peculiar to each day.

I am Dear Sir
Yours very truly
William Ellis
for the Astronomer Royal

umpfall Esq.

, so far as relates to the Barometer, and the
oration, and to deductions made therefrom
and minimum temperature), are founded upon
nto which the readings from the photographic
a double argument, the horizontal argument
ivil day, and the vertical argument through
eans of the numbers standing in the vertical
he mean monthly photographic values of the
day, the means of the numbers in the hori-
alue. To correct the values for instrumental
ndard barometer and the standard dry-bulb
Observatory are read by eye at 21^h, 0^h, 3^h,
ys and a few other days. The comparison
perature in the case of the barometer) with
photographs, gives the correction applicable
se hours. The mean correction at each of
month, corrections are interpolated for the
plied to the corresponding means of the
at each hour is obtained. The mean of the
month is adopted as the correction applicable
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nth obtained.

photographic barometer (already described),
that the basement temperature is maintained
l on the photographic record by changes of
e corrections can, without sensible error, be
ed. As regards the dry-bulb and wet-bulb
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ry-bulb and wet-bulb thermometers exposed

ometer, and of the dry-bulb and wet-bulb
on temperatures, found in the way described,
lts of the Meteorological Observations." The
ng tables (pages (lii) and (liii)).

the air and of evaporation are deduced, by use of Glaisher's Hygrometrical Tables, the mean daily temperature of the dew-point and degree of humidity. The factors used for calculating the dew-point given in these tables were found by Mr. Glaisher from the comparison of a great number of dew-point determinations, obtained by use of Daniell's hygrometer, with simultaneous observations of dry-bulb and wet-bulb thermometers. The first part of this investigation

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easily transferred to a sheet of paper speciall
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usually has a certain breadth, tapers off in the
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through fog or cloud.

§ 25. *Ozonom*

The Ozonometer (furnished by Messrs. Horn
south-west corner of the roof of the Photogr
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in the tables of "Daily Results") being taken a
The mean of the 21ʰ, 3ʰ, and 9ʰ values, as obse
in the foot notes.

§ 26. *Explanation of the Tables of Results of the Meteorological Observations.*

The results contained in this section refer generally to the civil day commencing
at midnight.

All results throughout the section, so far as relates to the Barometer, and the Temperature of the Air and Evaporation, and to deductions made therefrom (excepting observations of maximum and minimum temperature), are founded upon the photographic records. The form into which the readings from the photographic sheets were first entered is one having a double argument, the horizontal argument ranging through the 24 hours of the civil day, and the vertical argument through the days of a calendar month. The means of the numbers standing in the vertical columns being then taken, we obtain the mean monthly photographic values of the particular element at each hour of the day, the means of the numbers in the horizontal columns giving the mean daily value. To correct the values for instrumental error it is to be remarked that the standard barometer and the standard dry-bulb and wet-bulb thermometers of the Observatory are read by eye at 21^h, 0^h, 3^h, and 9^h of every day, except on Sundays and a few other days. The comparison of these readings (corrected for temperature in the case of the barometer) with the corresponding readings from the photographs, gives the correction applicable to the photographic readings at those hours. The mean correction at each of these hours being taken through a month, corrections are interpolated for the intermediate hours, which being applied to the corresponding means of the photographic readings, the true value at each hour is obtained. The mean of the twenty-four hourly corrections in each month is adopted as the correction applicable to each mean daily value in the month. Thus mean hourly and mean daily values for the several elements are in each month obtained.

And therefore as I supposed and suggested to Ellis in July or August 1879, they are too high by the heat of the lamp. They are in fact higher since the Photographs began. See tables and my diagram made in 1879. returned by Stanford March 3. 1880 —

Considering the construction of the photographic barometer (already described), and having regard to the circumstance that the basement temperature is maintained so nearly uniform, the effect produced on the photographic record by changes of temperature is very small, so that the corrections can, without sensible error, be grouped by months in the way described. As regards the dry-bulb and wet-bulb thermometers, the process of correction is equivalent to giving the photographic indications in terms of the standard dry-bulb and wet-bulb thermometers exposed on the free stand.

If so all right. But the effect of the lamp heat had not been thought of so far as appears.

The mean daily values of the barometer, and of the dry-bulb and wet-bulb thermometers, giving air and evaporation temperatures, found in the way described, are those inserted in the "Daily Results of the Meteorological Observations." The mean hourly values are given in following tables (pages (lii) and (liii)).

From the mean daily temperatures of the air and of evaporation are deduced, by use of Glaisher's Hygrometrical Tables, the mean daily temperature of the dew-point and degree of humidity. The factors used for calculating the dew-point given in these tables were found by Mr. Glaisher from the comparison of a great number of dew-point determinations, obtained by use of Daniell's hygrometer, with simultaneous observations of dry-bulb and wet-bulb thermometers. The first part of this investigation

was published in full, in the volume of *Magnetical and Meteorological Observations* for 1844, pages 67–72; it was based upon all the observations made up to that time. Subsequently, the comparison was extended to include all the simultaneous observations of these instruments made at the Royal Observatory, Greenwich, from 1841 to 1854, with some observations taken at high temperatures in India, and others at low and medium temperatures at Toronto. The results at the same temperature were found to be the same at these different localities, so far as the climatic circumstances permitted comparison.

The following table exhibits the result of the entire comparison.

TABLE OF FACTORS by which the DIFFERENCE of READINGS of the DRY-BULB and WET-BULB THERMOMETERS is to be MULTIPLIED in order to PRODUCE the DIFFERENCE between the READINGS of the DRY-BULB and DEW-POINT THERMOMETERS.

Reading of Dry-bulb Thermometer.	Factor.	Reading of Dry-bulb Thermometer.	Factor.	Reading of Dry-bulb Thermometer.	Factor.	Reading of Dry-bulb Thermometer.	Factor.
10°	8·78	33°	3·01	56°	1·94	79°	1·69
11	8·78	34	2·77	57	1·92	80	1·68
12	8·78	35	2·60	58	1·90	81	1·68
13	8·77	36	2·50	59	1·89	82	1·67
14	8·76	37	2·42	60	1·88	83	1·67
15	8·75	38	2·36	61	1·87	84	1·66
16	8·70	39	2·32	62	1·86	85	1·65
17	8·62	40	2·29	63	1·85	86	1·65
18	8·50	41	2·26	64	1·83	87	1·64
19	8·34	42	2·23	65	1·82	88	1·64
20	8·14	43	2·20	66	1·81	89	1·63
21	7·88	44	2·18	67	1·80	90	1·63
22	7·60	45	2·16	68	1·79	91	1·62
23	7·28	46	2·14	69	1·78	92	1·62
24	6·92	47	2·12	70	1·77	93	1·61
25	6·53	48	2·10	71	1·76	94	1·60
26	6·08	49	2·08	72	1·75	95	1·60
27	5·61	50	2·06	73	1·74	96	1·59
28	5·12	51	2·04	74	1·73	97	1·59
29	4·63	52	2·02	75	1·72	98	1·58
30	4·15	53	2·00	76	1·71	99	1·58
31	3·70	54	1·98	77	1·70	100	1·57
32	3·32	55	1·96	78	1·69		

In the same way the mean hourly values of the dew-point and degree of humidity in each month (pages (liii) and (liv)) have been calculated from the corresponding mean hourly values of air and evaporation temperatures (pages (lii) and (liii)).

The excess of the mean temperature of the air on each day above the average of 20 years, given in the "Daily Results," is found by comparing the numbers contained in column 6 with a table of average daily temperatures found by smoothing the numbers given in Table LXXVII. of the lately published "Reduction of

Greenwich Meteorological Observations, 1847–1873," which are similarly deduced from photographic records. The smoothed numbers are given in the following table.

SMOOTHED TABLE of the MEAN TEMPERATURE of the AIR as deduced from TWENTY-FOUR HOURLY READINGS on each Day for every Day of the Year as obtained from the PHOTOGRAPHIC RECORDS for the Period 1849–1868.

Day of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	38°·1	40°·5	40°·3	45°·3	48°·7	57°·5	61°·6	62°·6	60°·1	54°·7	47°·0	41°·5
2	37·9	40·6	40·4	45·7	48·9	57·7	61·5	62·7	60·0	54·4	46·7	41·8
3	37·8	40·7	40·5	46·1	49·1	57·9	61·4	62·7	59·8	54·0	46·4	42·1
4	37·7	40·7	40·5	46·4	49·4	58·1	61·4	62·7	59·7	53·7	46·0	42·4
5	37·6	40·6	40·5	46·6	49·7	58·2	61·5	62·7	59·5	53·4	45·6	42·6
6	37·6	40·4	40·5	46·7	50·0	58·3	61·7	62·7	59·3	53·0	45·2	42·7
7	37·6	40·2	40·6	46·8	50·3	58·4	61·9	62·7	59·0	52·7	44·7	42·8
8	37·7	39·9	40·6	46·8	50·6	58·5	62·2	62·7	58·8	52·5	44·3	42·8
9	37·7	39·6	40·7	46·9	50·8	58·5	62·5	62·7	58·5	52·3	43·8	42·8
10	37·8	39·3	40·7	46·9	51·1	58·6	62·7	62·7	58·3	52·1	43·4	42·7
11	37·9	39·1	40·8	47·0	51·4	58·7	62·9	62·7	58·1	51·9	43·0	42·5
12	38·1	38·9	40·8	47·1	51·8	58·8	63·1	62·6	58·0	51·7	42·6	42·2
13	38·2	38·8	40·9	47·2	52·1	58·9	63·3	62·5	57·8	51·6	42·3	41·8
14	38·3	38·7	41·0	47·4	52·5	59·1	63·4	62·4	57·6	51·4	42·0	41·5
15	38·4	38·7	41·1	47·5	52·9	59·3	63·4	62·3	57·4	51·3	41·8	41·1
16	38·5	38·8	41·2	47·6	53·3	59·5	63·5	62·1	57·3	51·2	41·6	40·8
17	38·6	38·9	41·3	47·8	53·7	59·7	63·5	61·9	57·1	51·1	41·5	40·5
18	38·8	39·0	41·4	47·9	54·1	59·9	63·4	61·8	56·9	51·0	41·5	40·2
19	38·9	39·2	41·4	48·0	54·4	60·2	63·3	61·6	56·8	50·8	41·4	40·0
20	39·1	39·3	41·5	48·1	54·7	60·5	63·2	61·4	56·6	50·6	41·3	39·8
21	39·3	39·5	41·6	48·2	55·0	60·8	63·0	61·3	56·4	50·4	41·2	39·6
22	39·5	39·6	41·7	48·2	55·3	61·1	62·9	61·3	56·2	50·1	41·1	39·4
23	39·6	39·7	41·8	48·3	55·5	61·4	62·8	61·2	56·1	49·7	41·0	39·3
24	39·7	39·8	42·0	48·3	55·7	61·7	62·7	61·1	55·9	49·4	41·0	39·3
25	39·8	39·9	42·3	48·4	55·9	61·9	62·7	61·0	55·8	49·1	40·9	39·2
26	39·9	40·0	42·6	48·4	56·1	62·0	62·7	60·9	55·7	48·8	40·8	39·1
27	40·0	40·1	43·0	48·4	56·3	62·0	62·6	60·8	55·5	48·5	40·8	39·0
28	40·1	40·2	43·4	48·5	56·5	61·9	62·6	60·7	55·4	48·2	40·9	38·8
29	40·2	..	43·8	48·5	56·8	61·8	62·6	60·6	55·2	47·9	41·0	38·7
30	40·3	..	44·3	48·6	57·0	61·7	62·6	60·4	54·9	47·6	41·2	38·5
31	40·4	..	44·8	..	57·3	..	62·6	60·3	..	47·3	..	38·3
Means	38·7	39·7	41·5	47·5	53·1	59·8	62·6	61·9	57·5	51·0	42·7	40·8

The mean of the twelve monthly values is 49°·7.

The daily register of rain contained in column 20 is that recorded by the gauge No. 7, whose receiving surface is 5 inches above the ground. This gauge is usually read at 21^h and 9^h. The continuous record of Osler's self-registering gauge shows whether the amounts measured at 21^h are to be placed to the same, or to the preceding civil day; and in cases in which rain fell both before and after midnight,

also gives the means of ascertaining the proper proportion of the 21h amount which should be placed to each civil day. The number of days of rain given in the foot notes and in the abstract tables, pages (li) and (lxii), is formed from the records of this gauge. In this numeration only those days are counted on which the fall amounted to or exceeded $0^{in}\cdot005$.

For understanding the divisions of time under the heads of Electricity and Clouds and Weather, the following remarks are necessary:—The day is divided by columns into two parts (from midnight to noon, and from noon to midnight), and each of these parts is subdivided into two or three parts by colons (:). Thus, when there is a single colon in the first column, it denotes that the remarks before it apply (roughly) to the interval from midnight to 6 A.M., and those following it to the interval from 6 A.M. to noon. When there are two colons in the first column, it is to be understood that the twelve hours are divided into three nearly equal parts of four hours each. And similarly for the second column. The exhibition of Electricity during the year 1877 was so scanty that the indications have been included in one column; in this case the colons subdivide the whole period of 24 hours (midnight to midnight).

The following is the explanation of the notation employed for record of electrical observations, it being premised that the quality of the Electricity is always to be supposed positive when no indication of quality is given:—

g-cur.	denotes	*galvanic currents*	s	denotes	*strong*
m	...	*moderate*	sp	...	*sparks*
N	...	*negative*	v	...	*variable*
P	...	*positive*	w	...	*weak*

The duplication of the letter denotes an intensity of the modification described, thus, s s is very strong; v v, very variable.

The action of the apparatus was by no means satisfactory during this year, great difficulty being experienced in maintaining proper insulation of the collecting wire, as has been already mentioned. In the month of August the insulation altogether failed, and the use of the apparatus was entirely discontinued. It is proposed to supersede it by the Thomson's self-recording Electrometer, to which reference has already been made.

The Clouds and Weather are described generally by Howard's Nomenclature; the figure denotes the proportion of sky covered by clouds, the whole sky being represented by 10. The notation is as follows:

a	denotes	*aurora borealis*	ci-s	denotes	*cirro-stratus*
ci	...	*cirrus*	cu	...	*cumulus*
ci-cu	...	*cirro-cumulus*	cu-s	...	*cumulo-stratus*

d	denotes	*dew*	m-r	denotes	*misty rain*
h-d	...	*heavy dew*	fr-m-r	...	*frequent misty rain*
f	...	*fog*	oc-m-r	...	*occasional misty rain*
sl-f	...	*slight fog*	sl-r	..	*slight rain*
th-f	...	*thick fog*	oc-sl-r	...	*occasional slight rain*
fr	...	*frost*	h-shs	...	*heavy showers*
g	...	*gale*	fr-shs	...	*frequent showers*
h-g	...	*heavy gale*	fr-h-shs	...	*frequent heavy showers*
glm	...	*gloom*	li-shs	...	*light showers*
gt-glm	...	*great gloom*	oc-shs	...	*occasional showers*
h-fr	...	*hoar frost*	oc-h-shs	...	*occasional heavy showers*
h	...	*haze*	sq	...	*squall*
hl	...	*hail*	sqs	...	*squalls*
so-ha	...	*solar halo*	fr-sqs	...	*frequent squalls*
l	...	*lightning*	h-sqs	...	*heavy squalls*
li-cl	...	*light clouds*	fr-h-sqs	...	*frequent heavy squalls*
lu-co	...	*lunar corona*	oc-sqs	...	*occasional squalls*
lu-ha	...	*lunar halo*	sc	...	*scud*
mt	...	*mist*	li-sc	...	*light scud*
sl-mt	...	*slight mist*	sl	...	*sleet*
n	...	*nimbus*	sn	...	*snow*
r	...	*rain*	oc-sn	...	*occasional snow*
th-r	...	*thin rain*	sl-sn	...	*slight snow*
oc-r	...	*occasional rain*	s	...	*stratus*
oc-th-r	...	*occasional thin rain*	t	...	*thunder*
fr-r	...	*frozen rain*	t-s	...	*thunder storm*
h-r	...	*heavy rain*	th-cl	...	*thin clouds*
sh-r	...	*shower of rain*	v	...	*variable*
shs-r	...	*showers of rain*	vv	...	*very variable*
c-r	...	*continued rain*	w	...	*wind*
c-h-r	...	*continued heavy rain*	st-w	...	*strong wind*

No particular explanation of the anemometric results seems necessary. It may be understood generally that the greatest pressures usually occur in gusts of short duration.

The remaining columns in the tables of "Daily Results" seem to require no special remark; all necessary explanation regarding the results therein contained will be found in the notes at the foot of the left-hand page, or in the descriptions of the several instruments given in preceding sections.

In regard to the comparisons of the extremes and means, &c. of meteorological

elements with average values contained in the foot notes, it may be mentioned that the photographic barometric results are compared with the corresponding barometric results, 1854–1873, and the photographic thermometric results and deductions therefrom with the corresponding thermometric results, 1849–1868 (see "Reduction of Greenwich Meteorological Observations 1847–1873"). Other deductions, from eye observations, are compared with averages for the period 1841–1876.

The tables of Meteorological Abstracts, following the Tables of "Daily Results," require no special explanation.

§ 27. *Observations of Luminous Meteors.*

In arranging for the observations of meteors, the directions circulated by the Committee of the British Association have received careful attention. On the nights specially mentioned in the directions systematic watch has been kept whenever the weather was sufficiently favourable. These nights are, January 2, and 15 to 19; February 10 and 19; March 1 to 4 and 18; April 20, and 25 to 30; May 18; June 6 and 20; July 17, 20, and 29; August 3 and 7 to 13 (especially August 10); September 10; October 1 to 6 and 16 to 23; November 12 to 14, 19, 28, and 30; December 6 to 14 (especially December 11) and December 24.

Special arrangements were made in the August and November periods for observing through the night, two observers being usually charged with the observations at these times, so that observations of all meteors that should present themselves might be secured.

The observers in the year 1877 were Mr. Ellis, Mr. Nash, Mr. Greengrass, Mr. Power, Mr. James, Mr. Hugo, and Mr. Simmons. Their observations are distinguished by the initials E., N., G., P., J., H., and S., respectively. One observation with the initial M. was made by Mr. Maunder.

§ 28. *Details of the Chemical Operations for the Photographic Records.*

The paper used in 1877 was principally furnished by Whatman.

First Operation.—Preliminary Preparation of the Paper.

The chemical solutions used in this process are the following:—

(1.) Sixteen grains of Iodide of Potassium are dissolved in one ounce of distilled water.

(2.) Twenty-four grains of Bromide of Potassium are dissolved in one ounce of distilled water.

(3.) When the crystals are dissolved, the two solutions are mixed together, forming the bromo-iodising solution. The mixture will keep through any length of time. Immediately before use, it is filtered through filtering paper.

A quantity of the paper, sufficient for the consumption of several weeks, is treated in the following manner, sheet after sheet.

The sheet of paper is pinned by its four corners to a horizontal board. Upon the paper, a sufficient quantity (about 50 minims, or $\frac{5}{48}$ of an ounce troy) of the bromo-iodising solution is applied, by pouring it upon the paper in front of a glass rod, which is then moved to and fro till the whole surface is uniformly wetted by the solution. Or, the solution may be evenly distributed by means of a camel-hair brush.

The paper thus prepared is allowed to remain in a horizontal position for a few minutes, and is then hung up to dry in the air; when dry, it is placed in a drawer, and may be kept through any length of time.

Second Operation.—Rendering the Paper sensitive to the Action of Light.

A solution of Nitrate of Silver is prepared by dissolving 50 grains of crystallized Nitrate of Silver in one ounce of distilled water. Since the magnetic basement has been used for photography, 15 grains of Acetic Acid have always been added to the solution.

Then the following operation is performed in a room illuminated by yellow light.

The paper is pinned as before upon a board somewhat smaller than itself, and (by means of a glass rod, as before,) its surface is wetted with 50 minims of the Nitrate of Silver solution. It is allowed to remain a short time in a horizontal position, and, if any part of the paper still shines from the presence of a part of the solution unabsorbed into its texture, the superfluous fluid is taken off by the application of blotting paper.

The paper, still damp, is immediately placed upon the cylinder, and is covered by the exterior glass tube, and the cylinder is mounted upon the revolving apparatus, to receive the spot of light formed by the mirror, which is carried by the magnet; or to receive the line of light passing through the thermometer tube.

Third Operation.—Development of the Photographic Trace.

When the paper is removed from the cylinder, it is placed as before upon a board, and a saturated solution of Gallic Acid, to which a few drops of Aceto-Nitrate of Silver are occasionally added, is spread over the paper by means of a glass rod, and this action is continued until the trace is fully developed. The solutions are kept in the magnetic basement, and are always used at the temperature of that room. When

the trace is well developed, the paper is placed in a vessel with water, and repeatedly washed with several changes of water; a brush being passed lightly over both sides of the paper to remove any crystalline deposit.

Fourth Operation.—Fixing the Photographic Trace.

The Photograph is placed in a solution of Hyposulphite of Soda, made by dissolving four or five ounces of the Hyposulphite in a pint of water; it is plunged completely in the liquid, and allowed to remain from one to two hours, until the yellow tint of the Iodide of Silver is removed. After this the sheet is washed repeatedly with water, allowed to remain immersed in water for 24 hours, and afterwards placed within folds of cotton cloths till nearly dry. Finally it is either ironed, or placed between sheets of blotting-paper and pressed.

§ 29. *Personal Establishment.*

The personal establishment during the year 1877 has consisted of William Ellis, Esq., Superintendent of the Magnetical and Meteorological Department, and William Carpenter Nash, Esq., Assistant.

Three or four computers have usually been attached to the Department.

Royal Observatory, Greenwich,
1879, July 30.

G. B. AIRY.

ROYAL OBSERVATORY, GREENWICH.

RESULTS

OF

MAGNETICAL OBSERVATIONS.

1877.

ROYAL OBSERVATORY, GREENWICH

REDUCTION

OF THE

MAGNETIC OBSERVATIONS.

1877.

TABLE I.—MEAN WESTERN DECLINATION of the MAGNET on each ASTRONOMICAL DAY, as deduced from the MEAN of TWENTY-FOUR HOURLY MEASURES of ORDINATES of the PHOTOGRAPHIC REGISTER on that DAY.

1877.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°
d	′	′	′	′	′	′	′	′	′	′	′	′
1	60·4	60·6	62·1	60·3	58·7	57·8	55·8	56·0	55·5	56·2	53·2	54·0
2	61·1	61·2	61·3	60·3	56·8	57·4	55·8	56·8	55·8	54·6	53·1	54·1
3	61·3	60·8	61·0	60·4	58·4	57·3	55·4	56·1	55·9	54·7	54·3	54·7
4	61·8	61·4	61·2	60·6	58·7	57·1	56·2	56·1	55·4	54·3	53·9	54·5
5	61·5	61·1	61·4	61·1	58·6	57·2	56·4	55·8	55·6	54·7	52·9	53·2
6	61·1	61·0	61·3	60·6	58·6	58·1	56·0	55·4	55·8	54·9	53·7	53·4
7	61·1	60·7	61·1	60·9	59·2	57·6	56·6	54·9	55·8	54·4	53·8	53·9
8	60·7	60·7	61·8	59·4	58·6	57·4	57·1	54·3	55·8	54·9	52·9	53·7
9	61·5	61·0	61·8	59·1	57·8	56·5	57·3	55·1	55·9	55·2	52·5	53·7
10	61·3	60·5	61·6	59·7	57·4	57·0	56·2	55·2	55·4	55·1	53·3	53·9
11	62·8	61·2	61·2	59·8	58·4	56·5	56·6	55·8	55·6	56·4	53·4	53·9
12	61·0	61·3	61·5	59·9	56·5	57·5	56·3	55·5	55·3	55·8	53·6	54·5
13	60·9	60·6	60·5	59·9	55·6	57·8	56·0	55·3	55·1	54·8	53·7	54·1
14	60·0	60·5	60·7	59·1	56·2	57·9	55·6	54·8	54·9	54·2	53·5	53·9
15	60·3	61·3	61·3	60·4	56·8	57·3	55·8	54·6	55·0	54·8	53·3	53·5
16	60·5	61·2	61·7	59·7	57·0	57·7	56·0	55·0	54·8	54·7	53·7	53·7
17	60·7	60·9	61·2	59·5	57·6	57·8	55·9	55·6	54·8	54·7	53·2	53·4
18	60·4	61·2	61·9	58·8	57·1	57·0	56·1	55·5	53·9	54·8	53·5	53·5
19	60·7	61·0	61·2	59·4	56·7	56·5	55·7	55·0	55·6	54·2	51·7	53·4
20	61·6	61·0	61·3	59·4	57·7	56·9	55·3	53·6	54·4	54·1	54·4	53·1
21	60·0	60·8	61·3	58·9	58·5	57·4	56·2	54·9	56·1	53·8	53·2	53·2
22	61·0	60·4	61·1	58·8	57·8	56·6	55·9	55·6	56·4	53·2	53·6	53·5
23	61·0	60·2	61·8	60·4	57·8	57·3	55·1	55·6	55·8	53·9	52·8	53·9
24	61·4	59·4	60·6	58·8	58·2	58·3	55·9	56·2	56·0	54·4	53·8	54·0
25	60·5	59·8	61·4	58·9	57·3	57·6	55·9	55·3	55·7	54·4	54·2	53·4
26	61·4	60·4	61·5	59·1	57·5	56·9	55·8	54·9	55·2	54·1	53·4	53·7
27	61·9	61·3	60·8	59·0	57·1	56·9	56·1	55·4	55·5	53·9	53·4	53·5
28	60·8	61·3	60·5	59·2	54·5	58·3	56·1	55·5	55·5	54·0	53·4	53·3
29	61·3		59·7	59·3	59·2	57·7	55·7	57·0	55·4	53·4	53·4	53·0
30	61·1		60·3	58·9	57·9	57·7	54·7	56·1	54·7	54·3	53·5	52·9
31	60·6		61·3		57·3		55·0	56·1		54·8		53·5

TABLE II.—MEAN MONTHLY DETERMINATION of the WESTERN DECLINATION of the MAGNET at every HOUR of the DAY; obtained by taking the MEAN of all the DETERMINATIONS at the same HOUR of the DAY through the MONTH.

1877.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°	18°
h	′	′	′	′	′	′	′	′	′	′	′	′
0	62·9	63·6	65·5	63·7	61·5	61·3	59·8	60·4	60·0	58·2	56·4	55·6
1	63·5	64·0	66·1	65·1	62·2	62·3	61·1	61·3	60·5	58·8	56·4	55·3
2	63·1	63·7	65·6	64·8	62·0	62·4	61·3	60·9	59·7	58·0	55·3	54·7
3	62·3	62·7	64·3	63·0	61·1	61·8	60·7	59·3	57·9	56·6	54·2	54·3
4	62·1	61·7	62·3	61·6	60·3	60·6	59·4	57·6	56·3	55·4	53·8	54·1
5	61·7	61·2	61·1	60·8	59·3	59·4	58·1	56·1	55·6	55·0	53·3	53·6
6	61·4	60·8	61·2	59·5	58·6	58·6	57·1	55·4	55·6	54·7	53·0	53·5
7	60·9	60·4	60·6	59·1	58·0	57·9	56·4	55·2	55·4	54·3	52·7	53·1
8	60·0	59·7	60·0	58·9	57·5	57·6	56·0	55·1	55·1	53·9	52·3	52·6
9	59·2	59·5	59·7	58·7	57·0	57·3	55·6	55·0	55·0	53·6	52·4	52·4
10	59·1	59·6	59·7	58·7	56·8	56·8	55·2	54·5	54·6	53·6	52·1	52·3
11	59·2	59·4	59·4	58·6	56·4	56·5	55·0	54·3	54·1	53·4	52·3	52·6
12	59·5	59·3	59·7	58·7	56·0	56·4	54·8	54·3	54·1	53·5	52·5	52·8
13	60·1	59·8	60·2	59·0	55·9	56·4	54·6	54·0	54·1	53·5	52·7	52·9
14	60·6	60·1	60·5	58·8	56·3	56·0	54·4	53·9	53·8	53·5	52·9	53·2
15	61·2	60·1	60·3	58·5	56·5	55·7	54·4	54·1	53·7	53·6	52·9	53·5
16	61·1	60·3	60·1	58·4	56·2	55·2	53·9	53·8	53·7	53·8	52·8	53·7
17	60·9	60·1	60·2	58·3	55·5	54·2	53·0	52·9	53·5	53·8	52·7	53·5
18	61·0	60·1	60·1	57·7	54·9	53·5	52·2	52·1	53·3	53·6	52·6	53·4
19	60·8	60·1	60·0	56·8	54·5	53·2	51·9	51·6	53·0	53·4	52·7	53·5
20	60·4	60·0	59·4	56·3	54·4	53·6	52·0	51·8	52·7	52·8	52·7	53·5
21	60·4	59·9	59·4	56·9	55·0	54·5	53·1	53·4	53·9	52·7	52·9	54·1
22	61·0	60·9	60·8	58·6	56·7	56·5	55·2	55·7	56·1	53·9	54·2	54·8
23	62·0	62·7	63·4	61·0	59·3	59·1	57·6	58·4	58·4	56·2	55·7	55·2

TABLE III.

1877.			
Month.	MEAN WESTERN DECLINATION of the MAGNET IN EACH MONTH.	EXCESS OF WESTERN DECLINATION above 18°, converted into WESTERLY FORCE, and expressed in terms of GAUSS'S UNIT measured on the METRICAL SYSTEM.	MONTHLY MEANS of all the Actual DIURNAL RANGES of the WESTERN DECLINATION, as deduced from the Twenty-four Hourly Measures of each day.
	° ′		′
January	19. 1·0	0·03190	6·0
February	19. 0·8	·03180	6·2
March	19. 1·2	·03201	9·4
April	18. 59·6	·03117	10·0
May	18. 57·6	·03012	9·6
June	18. 57·4	·03002	9·9
July	18. 55·9	·02924	10·2
August	18. 55·5	·02903	10·3
September	18. 55·4	·02897	9·2
October	18. 54·6	·02856	7·2
November	18. 53·4	·02793	6·2
December	18. 53·7	·02809	4·3
Mean	18. 57·2	0·02990	8·2

The unit adopted in column 3 is the Millimètre-Milligramme-Second Unit. To express the forces on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

TABLE IV.—MEAN HORIZONTAL MAGNETIC FORCE, expressed in terms of the Mean Horizontal Force for the Year, and diminished by a Constant (0·86000 nearly), uncorrected for TEMPERATURE, on each ASTRONOMICAL DAY; as deduced from the MEAN of TWENTY-FOUR HOURLY MEASURES of ORDINATES of the PHOTOGRAPHIC REGISTER on that DAY.

1877.												
Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d												
1	0·12701	0·12724	0·12642	0·12617	0·12659	0·12788	0·12772	0·12548	0·12608	0·12568	0·12823	0·12823
2	·12697	·12711	·12654	·12636	·12572	·12832	·12755	·12602	·12627	·12612	·12797	·12861
3	·12743	·12678	·12671	·12641	·12543	·12727	·12761	·12679	·12615	·12649	·12731	·12821
4	·12705	·12672	·12648	·12623	·12575	·12721	·12727	·12643	·12651	·12619	·12779	·12772
5	·12816	·12688	·12655	·12643	·12572	·12757	·12726	·12587	·12625	·12632	·12749	·12747
6	·12639	·12670	·12668	·12644	·12564	·12798	·12742	·12583	·12621	·12631	·12743	·12830
7	·12692	·12681	·12637	·12663	·12560	·12761	·12745	·12675	·12641	·12664	·12720	·12789
8	·12703	·12675	·12637	·12636	·12533	·12729	·12711	·12769	·12615	·12627	·12678	·12817
9	·12702	·12654	·12645	·12643	·12507	·12736	·12690	·12719	·12605	·12657	·12729	·12863
10	·12665	·12685	·12516	·12650	·12531	·12730	·12683	·12712	·12634	·12675	·12717	·12835
11	·12690	·12633	·12595	·12675	·12539	·12795	·12698	·12758	·12680	·12622	·12794	·12839
12	·12732	·12647	·12621	·12677	·12585	·12677	·12713	·12751	·12662	·12718	·12804	·12755
13	·12750	·12623	·12628	·12708	·12598	·12625	·12730	·12777	·12648	·12735	·12823	·12783
14	·12732	·12621	·12620	·12685	·12622	·12550	·12745	·12727	·12719	·12664	·12802	·12788
15	·12670	·12618	·12661	·12625	·12658	·12577	·12791	·12725	·12659	·12644	·12811	·12811
16	·12668	·12623	·12661	·12636	·12726	·12582	·12764	·12722	·12671	·12696	·12765	·12780
17	·12715	·12658	·12672	·12661	·12697	·12579	·12770	·12684	·12704	·12733	·12814	·12845
18	·12733	·12673	·12686	·12674	·12678	·12530	·12775	·12638	·12625	·12810	·12825	·12800
19	·12730	·12622	·12672	·12708	·12722	·12570	·12729	·12662	·12575	·12820	·12797	·12810
20	·12722	·12613	·12686	·12688	·12762	·12599	·12708	·12664	·12638	·12813	·12739	·12828
21	·12746	·12661	·12675	·12707	·12730	·12605	·12694	·12668	·12620	·12833	·12823	·12847
22	·12745	·12653	·12638	·12700	·12735	·12600	·12685	·12672	·12641	·12837	·12826	·12850
23	·12635	·12668	·12612	·12635	·12693	·12608	·12675	·12657	·12614	·12778	·12848	·12810
24	·12653	·12689	·12601	·12643	·12721	·12549	·12627	·12698	·12597	·12688	·12780	·12797
25	·12622	·12665	·12617	·12633	·12686	·12725	·12665	·12811	·12612	·12720	·12766	·12791
26	·12639	·12669	·12620	·12658	·12729	·12753	·12660	·12803	·12587	·12751	·12832	·12794
27	·12645	·12635	·12636	·12662	·12707	·12735	·12629	·12826	·12602	·12753	·12848	·12812
28	·12671	·12663	·12641	·12637	·12691	·12712	·12705	·12655	·12623	·12736	·12843	·12802
29	·12685		·12622	·12670	·12654	·12658	·12636	·12573	·12632	·12753	·12836	·12849
30	·12674		·12610	·12646	·12724	·12744	·12632	·12637	·12649	·12721	·12808	·12850
31	·12675		·12621		·12747		·12597	·12612		·12776		·12820

TABLE V.—DAILY MEANS of READINGS (usually eight on each Day) of the THERMOMETER placed on the box inclosing the HORIZONTAL FORCE MAGNETOMETER, for each ASTRONOMICAL DAY.

1877.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	62·0	63·5	61·7	63·4	62·9	63·6	66·8	69·8	63·7	65·2	63·5	62·5
2	61·6	62·3	62·4	63·7	63·1	62·6	67·0	68·0	65·9	65·1	62·9	62·3
3	62·2	62·2	63·1	64·7	62·8	67·3	67·0	68·0	66·0	63·9	62·7	62·3
4	62·9	62·3	61·7	64·9	62·4	67·0	67·1	69·1	65·6	64·2	62·4	62·5
5	61·7	63·1	61·9	64·0	62·6	65·5	66·9	71·2	65·7	64·5	63·8	62·1
6	61·2	63·7	61·9	63·7	63·3	64·3	65·8	72·6	65·7	64·8	64·9	62·5
7	62·2	63·8	61·9	63·4	63·9	64·3	65·6	71·3	65·3	64·0	64·7	62·1
8	63·2	63·4	62·2	63·6	64·8	65·9	65·8	69·1	64·8	63·9	64·2	62·3
9	62·4	63·7	62·6	64·4	65·6	67·2	67·2	69·1	65·7	63·5	63·9	60·6
10	62·1	63·6	61·9	63·6	65·1	68·2	68·9	68·3	66·5	63·7	63·3	60·3
11	60·9	62·3	61·0	63·3	64·4	68·9	69·2	67·6	67·3	64·5	61·3	61·3
12	59·8	63·0	62·2	63·2	64·2	68·7	68·6	67·9	67·7	64·1	61·4	61·1
13	60·6	63·5	62·8	62·9	64·3	66·8	68·7	69·2	67·9	64·7	60·5	60·8
14	61·3	63·9	63·0	63·1	64·6	66·8	69·2	70·2	68·1	66·0	61·8	60·7
15	61·9	63·9	62·4	61·3	64·4	66·7	67·8	70·0	66·8	64·5	63·5	61·4
16	63·3	63·1	61·6	60·9	64·6	67·5	67·9	71·2	65·1	62·5	63·3	62·1
17	62·9	62·4	61·9	62·1	64·0	68·8	67·3	70·2	65·2	61·3	62·5	61·1
18	62·7	62·9	59·1	62·3	64·4	69·7	67·4	70·8	65·8	61·3	61·4	61·7
19	63·1	62·0	62·1	62·4	64·5	69·9	67·5	73·2	65·5	62·4	61·5	61·5
20	62·6	61·5	62·5	62·3	63·2	69·0	67·6	75·5	63·8	63·8	60·7	62·1
21	58·4	61·2	61·8	62·7	62·8	68·9	68·5	71·8	61·7	64·1	61·6	62·3
22	58·7	62·1	62·6	63·6	63·0	68·5	69·6	69·6	62·5	63·7	60·7	62·2
23	61·7	62·7	63·1	63·5	62·7	67·2	70·3	67·2	62·9	63·3	59·8	61·5
24	63·2	62·3	63·7	62·7	63·0	66·6	69·8	67·2	63·8	63·8	61·0	61·0
25	63·8	62·0	63·3	62·5	64·0	66·9	69·8	67·8	64·6	64·1	60·8	60·9
26	62·2	61·7	63·6	61·9	63·8	67·3	69·7	68·8	65·1	63·7	61·7	61·1
27	62·3	61·2	64·0	62·1	63·8	67·4	70·3	68·9	65·1	64·4	61·5	60·4
28	61·7	60·4	63·9	62·5	63·8	68·0	70·2	69·1	65·2	63·9	61·5	61·2
29	62·2		64·5	62·4	63·3	69·3	71·4	68·6	65·6	64·3	61·5	62·6
30	62·3		63·0	63·5	63·4	67·1	71·7	67·5	65·4	64·8	61·7	61·6
31	63·0		63·9		63·7		72·1	66·3		64·0		61·7

TABLE VI.—MEAN MONTHLY DETERMINATION of the HORIZONTAL MAGNETIC FORCE, expressed in terms of the Mean Horizontal Force for the Year, and diminished by a Constant (0·86000 nearly), uncorrected for TEMPERATURE, at every HOUR of the DAY; obtained by taking the MEAN of all the DETERMINATIONS at the same HOUR of the DAY through each MONTH.

1877.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h												
0	0·12666	0·12626	0·12586	0·12575	0·12578	0·12628	0·12639	0·12614	0·12587	0·12655	0·12765	0·12823
1	·12691	·12643	·12610	·12[illegible]18	·12618	·12641	·12658	·12646	·12613	·12686	·12786	·12835
2	·12709	·12655	·12634	·12646	·12653	·12672	·12699	·12681	·12636	·12714	·12800	·12826
3	·12718	·12652	·12640	·12675	·12681	·12703	·12723	·12702	·12639	·12726	·12805	·12816
4	·12705	·12653	·12638	·12693	·12705	·12717	·12733	·12706	·12642	·12729	·12813	·12806
5	·12695	·12652	·12639	·12714	·12728	·12725	·12761	·12700	·12650	·12728	·12813	·12802
6	·12698	·12661	·12650	·12711	·12733	·12728	·12775	·12720	·12663	·12735	·12803	·12806
7	·12697	·12657	·12665	·12717	·12733	·12738	·12771	·12732	·12674	·12741	·12793	·12806
8	·12686	·12656	·12669	·12712	·12714	·12731	·12756	·12725	·12672	·12732	·12804	·12802
9	·12674	·12656	·12672	·12702	·12695	·12719	·12732	·12725	·12669	·12735	·12798	·12799
10	·12680	·12660	·12672	·12698	·12696	·12709	·12751	·12717	·12673	·12736	·12793	·12807
11	·12689	·12674	·12670	·12692	·12689	·12708	·12738	·12722	·12669	·12732	·12787	·12802
12	·12688	·12668	·12666	·12680	·12672	·12702	·12739	·12725	·12668	·12727	·12790	·12794
13	·12691	·12663	·12661	·12674	·12655	·12701	·12738	·12724	·12659	·12721	·12782	·12799
14	·12691	·12660	·12655	·12669	·12637	·12702	·12731	·12721	·12653	·12715	·12781	·12801
15	·12695	·12661	·12646	·12657	·12638	·12707	·12728	·12717	·12649	·12713	·12790	·12809
16	·12703	·12665	·12640	·12654	·12639	·12705	·12725	·12717	·12651	·12717	·12805	·12820
17	·12717	·12679	·12649	·12662	·12635	·12701	·12719	·12717	·12656	·12723	·12801	·12831
18	·12724	·12686	·12654	·12667	·12621	·12690	·12707	·12706	·12645	·12719	·12808	·12834
19	·12723	·12690	·12639	·12657	·12583	·12656	·12679	·12670	·12620	·12707	·12797	·12833
20	·12717	·12681	·12621	·12623	·12557	·12612	·12640	·12619	·12583	·12686	·12776	·12827
21	·12697	·12660	·12591	·12588	·12545	·12577	·12613	·12581	·12547	·12649	·12750	·12813
22	·12681	·12643	·12565	·12570	·12541	·12561	·12601	·12569	·12532	·12623	·12741	·12812
23	·12675	·12631	·12568	·12547	·12553	·12570	·12606	·12585	·12548	·12632	·12741	·12821

TABLE VII.—MONTHLY MEANS of READINGS of the THERMOMETER placed on the box inclosing the HORIZONTAL FORCE MAGNETOMETER, at each of the ordinary Hours of Observation.

1877.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h	°	°	°	°	°	°	°	°	°	°	°	°
0	62·0	62·8	62·6	63·1	63·8	67·3	68·5	69·8	65·5	64·0	62·3	61·7
1	61·9	62·7	62·6	63·2	64·0	67·5	68·7	70·0	65·7	64·0	62·5	61·8
2	62·1	62·7	62·7	63·3	64·1	67·6	68·9	70·0	65·9	64·3	62·6	62·0
3	62·2	62·8	62·8	63·2	64·1	67·7	69·0	70·1	66·0	64·3	62·5	61·9
9	62·4	62·9	62·6	63·3	63·8	67·5	68·8	69·0	65·6	64·1	62·3	61·5
21	61·8	62·3	62·2	62·6	63·5	66·7	67·9	68·7	64·7	63·6	61·9	61·4
22	61·9	62·3	62·2	62·7	63·5	67·1	68·0	68·8	65·0	63·4	61·9	61·2
23	61·7	62·7	62·4	62·8	63·5	66·9	68·2	69·1	65·2	63·4	61·9	61·2

TABLE VIII.

1877.

Month.	MEAN HORIZONTAL MAGNETIC FORCE in EACH MONTH, uncorrected for TEMPERATURE. Expressed in terms of the MEAN HORIZONTAL FORCE for the Year, and diminished by a Constant (0·86000 nearly).	Expressed in terms of GAUSS'S UNIT measured on the METRICAL SYSTEM, and diminished by a Constant (1·54671 nearly).	Mean Temperature.
			°
January …………………	0·12696	0·22834	62·0
February…………………	·12660	·22769	62·6
March …………………	·12638	·22729	62·5
April …………………	·12657	·22764	63·0
May…………………	·12646	·22744	63·8
June …………………	·12678	·22801	67·3
July…………………	·12708	·22855	68·5
August …………………	·12685	·22814	69·4
September …………………	·12633	·22720	65·5
October …………………	·12708	·22855	63·9
November…………………	·12788	·22999	62·2
December …………………	·12814	·23046	61·6

The unit adopted in column 3 is the Millimètre-Milligramme-Second Unit. To express the forces on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

The value 0·86000 of Horizontal Force corresponds to 1·54671 of Gauss's Unit on the Metrical (Millimètre-Milligramme-Second) system, and to 0·15467 on the C.G.S. System.

TABLE IX.—MEAN VERTICAL MAGNETIC FORCE, expressed in terms of the Mean Vertical Force for the Year, and diminished by a Constant (0·96000 nearly), uncorrected for TEMPERATURE, on each ASTRONOMICAL DAY; as deduced from the MEAN of TWENTY-FOUR HOURLY MEASURES of ORDINATES of the PHOTOGRAPHIC REGISTER on that DAY.

1877.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d												
1	..	0·03641	0·03455	0·03580	0·03474	0·03483	0·03573	0·03590	0·03303	0·03208	0·03093	0·02975
2	..	·03583	·03517	·03573	·03438	·03457	·03538	·03456	·03329	·03189	·03086	·02973
3	..	·03568	·03536	·03605	·03443	·03605	·03535	·03467	·03350	·03160	·03077	·02987
4	0·03660	·03566	·03491	·03601	·03475	·03639	·03534	·03552	·03313	·03170	·03069	·02994
5	·03597	·03595	·03486	·03573	·03531	·03505	·03528	·03650	·03296	·03167	·03123	·02982
6	·03607	·03616	·03485	·03549	·03549	·03457	·03481	·03669	·03304	·03198	·03182	·03002
7	·03630	·03620	·03501	·03534	·03590	·03461	·03439	·03625	·03310	·03155	·03173	·02986
8	·03670	·03590	·03492	·03571	·03617	·03553	·03459	·03552	·03263	·03150	·03157	·02950
9	·03632	·03623	·03513	·03592	·03640	·03602	·03513	·03517	·03325	·03126	·03132	·02905
10	·03610	·03579	·03506	·03567	·03589	·03648	·03620	·03489	·03334	·03138	·03093	·02846

TABLE IX.—MEAN VERTICAL MAGNETIC FORCE, expressed in terms of the Mean Vertical Force for the Year, &c.—*continued.*

1877.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d												
11	0·03566	0·03560	0·03459	0·03553	0·03558	0·03683	0·03605	0·03431	0·03366	0·03128	0·03035	0·02916
12	·03514	·03568	·03517	·03552	·03526	·03693	·03567	·03482	·03377	·03192	·02991	·02908
13	·03572	·03617	·03570	·03527	·03520	·03559	·03570	·03530	·03416	·03225	·02934	·02870
14	·03603	·03666	·03551	·03517	·03525	·03578	·03597	·03568	·03419	·03288	·02984	·02862
15	·03588	·03618	·03510	·03478	·03522	·03584	·03540	·03548	·03348	·03163	·03074	·02887
16	·03630	·03579	·03479	·03426	·03510	·03597	·03520	·03589	·03291	·03068	·03065	·02934
17	·03608	·03520	·03485	·03468	·03485	·03655	·03482	·03536	·03272	·03022	·03013	·02915
18	·03619	·03572	·03416	·03492	·03494	·03688	·03495	·03590	·03276	·03001	·02996	·02895
19	·03643	·03517	·03497	·03495	·03474	·03700	·03544	·03670	·03313	·03066	·02979	·02874
20	·03615	·03481	·03500	·03486	·03440	·03650	·03471	·03708	·03198	·03135	·02957	·02904
21	·03515	·03491	·03492	·03480	·03428	·03654	·03530	·03620	·03105	·03134	·03005	·02924
22	·03518	·03509	·03511	·03506	·03440	·03643	·03566	·03535	·03125	·03132	·02939	·02899
23	·03564	·03526	·03528	·03488	·03454	·03544	·03633	·03418	·03158	·03072	·02867	·02887
24	·03604	·03525	·03565	·03487	·03457	·03557	·03577	·03424	·03176	·03109	·02965	·02849
25	·03662	·03518	·03527	·03479	·03496	·03564	·03578	·03485	·03220	·03148	·02968	·02852
26	·03594	·03507	·03573	·03403	·03492	·03588	·03580	·03496	·03256	·03164	·02971	·02853
27	·03623	·03477	·03542	·03416	·03496	·03564	·03580	·03511	·03226	·03147	·02960	·02818
28	·03581	·03423	·03540	·03440	·03450	·03588	·03636	·03496	·03209	·03129	·02957	·02859
29	·03594		·03573	·03424	·03488	·03658	·03726	·03480	·03222	·03152	·02932	·02959
30	·03600		·03519	·03423	·03481	·03688	·03741	·03421	·03218	·03203	·02951	·02923
31	·03628		·03582		·03532		·03791	·03353		·03152		·02857

TABLE X.—DAILY MEANS of READINGS (usually eight on each Day) of the THERMOMETER placed on the box inclosing the VERTICAL FORCE MAGNETOMETER, for each ASTRONOMICAL DAY.

1877.

Days of the Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	..	63·3	61·4	63·1	62·5	63·6	66·4	68·9	65·7	64·2	63·5	62·3
2	..	61·8	62·3	63·6	63·0	62·6	66·7	66·8	65·9	64·8	63·0	62·1
3	..	61·9	63·0	64·5	62·4	67·2	67·0	67·4	66·2	64·2	62·9	62·1
4	62·6	62·0	61·6	64·4	62·6	67·0	67·0	69·1	65·6	64·2	62·6	62·1
5	61·6	63·1	61·8	63·4	62·6	64·6	66·9	70·8	65·7	63·8	64·0	61·7
6	61·1	63·4	61·7	63·1	63·7	64·1	65·5	71·6	65·9	64·8	65·1	62·5
7	62·4	63·4	61·5	63·1	64·0	64·6	64·9	71·0	65·4	63·9	64·9	61·9
8	62·8	62·8	61·9	63·8	64·6	66·4	65·0	69·1	64·9	63·7	64·2	62·2
9	62·2	63·9	62·6	64·2	65·0	67·8	66·6	68·5	66·2	63·1	63·7	61·1
10	62·0	63·3	61·9	63·4	64·8	68·2	68·8	68·5	66·7	63·5	63·2	60·2
11	61·1	62·0	60·9	63·2	64·3	69·3	68·7	67·3	67·5	64·0	61·8	61·6
12	60·0	63·0	62·4	63·7	64·2	68·8	68·3	67·8	67·9	64·2	61·6	60·9
13	61·5	63·6	63·0	62·7	64·0	66·1	68·5	69·1	68·2	64·8	60·0	60·7
14	61·8	63·8	62·7	62·9	64·5	66·5	69·0	69·5	68·4	65·9	61·7	60·5
15	62·0	63·8	62·0	61·6	64·0	66·9	66·9	69·9	66·9	63·8	63·7	61·2
16	62·9	63·2	61·4	61·2	63·8	68·0	66·7	70·4	65·2	62·5	63·3	61·9
17	62·0	62·0	61·7	62·6	63·5	69·5	65·8	69·4	65·3	61·5	62·7	61·2
18	62·6	63·2	58·8	62·4	63·9	70·1	66·5	70·7	66·0	61·2	61·5	61·4
19	63·1	61·9	62·1	62·5	64·6	69·9	66·7	71·8	65·6	62·7	61·9	61·0
20	62·5	61·3	62·4	62·2	63·1	69·0	66·3	73·0	63·7	64·3	60·9	61·9
21	57·6	61·0	61·9	62·8	62·5	68·9	67·8	71·5	61·3	64·4	61·8	62·1
22	58·2	62·0	62·2	63·6	62·9	68·2	68·5	69·3	62·2	63·5	60·7	61·8
23	61·8	62·7	62·8	63·5	62·8	66·7	70·2	67·0	62·7	62·8	59·6	60·7
24	62·6	62·1	63·7	62·8	63·0	67·0	69·1	67·5	63·4	63·2	61·5	60·5
25	63·1	61·9	62·8	62·9	63·8	67·2	69·4	68·1	64·8	63·7	61·2	60·0
26	61·6	61·5	63·4	62·0	64·0	67·1	69·3	68·8	65·6	63·9	61·8	60·2
27	62·4	60·8	63·9	62·4	63·7	67·1	70·0	68·8	64·8	64·7	61·1	59·4
28	61·1	59·8	63·7	62·7	63·9	68·1	69·6	69·1	64·7	63·5	61·7	60·8
29	62·1		64·5	61·8	63·4	69·8	70·9	68·6	65·3	63·9	61·4	63·0
30	62·1		62·6	62·2	63·6	70·1	71·3	67·7	64·7	64·5	61·6	61·0
31	63·3		64·0		64·1		71·6	66·4		63·6		60·6

TABLE XI.—MEAN MONTHLY DETERMINATION of the VERTICAL MAGNETIC FORCE, expressed in terms of the Mean Vertical Force for the Year, and diminished by a Constant (0·96000 nearly), uncorrected for TEMPERATURE, at every HOUR of the DAY; obtained by taking the MEAN of all the DETERMINATIONS at the same HOUR of the DAY through each MONTH.

1877.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h												
0	0·03581	0·03545	0·03464	0·03465	0·03454	0·03559	0·03523	0·03509	0·03242	0·03107	0·03002	0·02898
1	·03592	·03558	·03483	·03479	·03474	·03582	·03547	·03533	·03260	·03121	·03020	·02911
2	·03602	·03566	·03505	·03502	·03496	·03605	·03566	·03556	·03282	·03136	·03033	·02923
3	·03607	·03572	·03523	·03514	·03511	·03622	·03584	·03577	·03297	·03151	·03037	·02926
4	·03610	·03575	·03537	·03526	·03525	·03639	·03602	·03585	·03308	·03161	·03037	·02928
5	·03615	·03575	·03541	·03537	·03535	·03655	·03611	·03588	·03312	·03167	·03046	·02932
6	·03625	·03580	·03539	·03541	·03540	·03661	·03618	·03588	·03313	·03171	·03052	·02932
7	·03626	·03583	·03541	·03542	·03535	·03664	·03623	·03581	·03317	·03174	·03055	·02930
8	·03628	·03582	·03543	·03542	·03532	·03662	·03623	·03573	·03317	·03173	·03053	·02927
9	·03627	·03579	·03538	·03539	·03529	·03654	·03615	·03564	·03312	·03168	·03045	·02923
10	·03624	·03575	·03533	·03537	·03525	·03636	·03604	·03552	·03305	·03165	·03041	·02919
11	·03618	·03574	·03533	·03538	·03525	·03618	·03591	·03541	·03299	·03167	·03041	·02916
12	·03612	·03568	·03531	·03534	·03520	·03600	·03579	·03527	·03291	·03164	·03037	·02916
13	·03607	·03565	·03525	·03529	·03513	·03587	·03568	·03520	·03287	·03161	·03031	·02914
14	·03601	·03561	·03520	·03519	·03506	·03574	·03558	·03515	·03278	·03156	·03025	·02912
15	·03598	·03558	·03514	·03511	·03500	·03566	·03552	·03507	·03271	·03151	·03019	·02909
16	·03592	·03554	·03511	·03508	·03498	·03561	·03545	·03502	·03264	·03145	·03010	·02905
17	·03589	·03548	·03507	·03502	·03500	·03552	·03542	·03496	·03259	·03138	·03008	·02901
18	·03585	·03545	·03504	·03496	·03498	·03541	·03532	·03491	·03255	·03131	·03006	·02899
19	·03584	·03541	·03504	·03492	·03495	·03540	·03526	·03489	·03252	·03128	·03005	·02895
20	·03584	·03538	·03499	·03484	·03487	·03543	·03524	·03488	·03242	·03124	·03005	·02889
21	·03579	·03532	·03488	·03470	·03475	·03549	·03522	·03490	·03235	·03115	·02999	·02887
22	·03575	·03524	·03474	·03462	·03463	·03553	·03517	·03485	·03230	·03105	·02990	·02885
23	·03578	·03522	·03465	·03455	·03453	·03552	·03514	·03485	·03227	·03098	·02984	·02888

TABLE XII.—MONTHLY MEANS of READINGS of the THERMOMETER placed on the box inclosing the VERTICAL FORCE MAGNETOMETER, at each of the ordinary Hours of Observation.

1877.

Hour, Greenwich Mean Solar Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
h	°	°	°	°	°	°	°	°	°	°	°	°
0	61·9	62·7	62·5	63·1	63·7	67·6	68·0	69·4	65·5	63·8	62·4	61·4
1	61·8	62·6	62·5	63·1	64·0	67·7	68·3	69·6	65·8	63·9	62·6	61·6
2	62·0	62·6	62·6	63·2	64·0	68·2	68·6	69·7	66·1	64·2	62·6	61·8
3	62·2	62·6	62·7	63·2	64·0	68·1	68·6	69·7	66·1	64·2	62·6	61·7
9	62·4	62·7	62·7	63·4	63·8	67·6	68·3	69·0	65·9	64·2	62·6	61·3
21	61·6	62·0	61·9	62·4	63·3	66·3	67·1	68·3	64·7	63·2	61·9	60·9
22	61·5	62·1	61·8	62·6	63·2	66·7	67·2	68·4	64·9	63·1	61·9	60·8
23	61·4	62·4	62·1	62·8	63·3	66·8	67·5	68·7	65·1	63·2	61·8	60·9

TABLE XIII.

1877.

Month.	Mean Vertical Magnetic Force in each Month, uncorrected for Temperature. Expressed in terms of the Mean Vertical Force for the Year, and diminished by a Constant (0·96000 nearly).	Expressed in terms of Gauss's Unit measured on the Metrical System, and diminished by a Constant (4·20211 nearly).	Mean Temperature.
			°
January	0·03602	0·15767	61·8
February	·03559	·15578	62·5
March	·03513	·15377	62·3
April	·03509	·15360	63·0
May	·03504	·15338	63·7
June	·03595	·15736	67·4
July	·03566	·15609	67·9
August	·03531	·15456	69·1
September	·03277	·14344	65·5
October	·03145	·13766	63·7
November	·03024	·13237	62·3
December	·02911	·12742	61·3

The unit adopted in column 3 is the Millimètre-Milligramme-Second Unit. To express the forces on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

The value 0·96000 of Vertical Force corresponds to 4·20211 of Gauss's Unit on the Metrical (Millimètre-Milligramme-Second) system, and to 0·42021 on the C.G.S. System.

TABLE XIV.—MEAN, through the Range of Months, of the MONTHLY MEAN DETERMINATIONS of the DIURNAL INEQUALITIES of DECLINATION, HORIZONTAL FORCE, and VERTICAL FORCE, for the Year 1877.

(*The Results for Horizontal Force and Vertical Force are not corrected for Temperature.*)

January to December.

Hour, Greenwich Mean Solar Time.	Inequality of Declination.	Equivalent in terms of Gauss's Unit measured on the Metrical System.	Inequality of Horizontal Force.	Equivalent in terms of Gauss's Unit measured on the Metrical System.	Inequality of Vertical Force.	Equivalent in terms of Gauss's Unit measured on the Metrical System.
h	′					
0	+ 3·57	+ 0·00187	− 0·00049	− 0·00088	− 0·00032	− 0·00140
1	+ 4·21	+ 220	− 22	− 40	− 15	− 66
2	+ 3·78	+ 198	+ 1	+ 2	+ 3	+ 13
3	+ 2·67	+ 140	+ 14	+ 25	+ 15	+ 66
4	+ 1·59	+ 83	+ 19	+ 34	+ 25	+ 109
5	+ 0·76	+ 40	+ 25	+ 45	+ 31	+ 136
6	+ 0·28	+ 15	+ 31	+ 56	+ 35	+ 153
7	− 0·17	− 9	+ 34	+ 61	+ 36	+ 158
8	− 0·62	− 32	+ 29	+ 52	+ 35	+ 153
9	− 0·89	− 47	+ 24	+ 43	+ 30	+ 131
10	− 1·09	− 57	+ 23	+ 41	+ 23	+ 101
11	− 1·24	− 65	+ 22	+ 40	+ 19	+ 83
12	− 1·21	− 63	+ 17	+ 31	+ 12	+ 53
13	− 1·08	− 56	+ 13	+ 23	+ 6	+ 26
14	− 1·01	− 53	+ 9	+ 16	− 1	− 4
15	− 0·97	− 51	+ 8	+ 14	− 7	− 31
16	− 1·09	− 57	+ 11	+ 20	− 12	− 53
17	− 1·46	− 76	+ 15	+ 27	− 16	− 70
18	− 1·80	− 94	+ 12	+ 22	− 21	− 92
19	− 2·05	− 107	− 5	− 9	− 24	− 105
20	− 2·21	− 116	− 31	− 56	− 27	− 118
21	− 1·66	− 87	− 58	− 104	− 33	− 144
22	− 0·14	− 7	− 74	− 133	− 39	− 171
23	+ 1·82	+ 95	− 69	− 124	− 43	− 188

Hour, Greenwich Mean Solar Time.	Mean Readings of Thermometers.	
	Horizontal Force.	Vertical Force.
h	°	°
0	64·45	64·33
1	64·55	64·46
2	64·68	64·63
3	64·72	64·64
9	64·48	64·49
21	63·94	63·63
22	64·00	63·68
23	64·08	63·83

The unit adopted in columns 3, 5, and 7 is the Millimètre-Milligramme-Second Unit. To express the inequalities on the Centimètre-Gramme-Second (C.G.S.) system, the numbers must be divided by 10, equivalent to shifting the decimal point one step towards the left.

ROYAL OBSERVATORY, GREENWICH.

RESULTS

OF

OBSERVATIONS

OF THE

MAGNETIC DIP.

1877.

RESULTS OF OBSERVATIONS OF MAGNETIC DIP, on each Day of Observation.

Day and Approximate Hour. 1877.		Needle.	Length of Needle.	Magnetic Dip.	Observer.
	d h			° ′ ″	
January	5. 2	C 1	6 inches	67. 39. 32	N
	13. 1	D 1	3 ,,	67. 43. 7	N
	19. 2	C 2	6 ,,	67. 42. 17	N
	20. 1	B 1	9 ,,	67. 40. 26	N
	23. 0	C 1	6 ,,	67. 41. 20	N
	23. 2	C 2	6 ,,	67. 42. 15	N
	23. 22	D 2	3 ,,	67. 43. 10	N
	23. 23	D 1	3 ,,	67. 41. 57	N
	24. 3	D 2	3 ,,	67. 40. 53	N
	30. 0	B 2	9 ,,	67. 38. 47	N
	30. 23	C 1	6 ,,	67. 40. 21	N
	31. 0	B 1	9 ,,	67. 39. 28	N
	31. 2	C 2	6 ,,	67. 41. 21	N
February	3. 1	D 2	3 ,,	67. 43. 46	N
	9. 2	D 1	3 ,,	67. 41. 45	N
	14. 2	B 2	9 ,,	67. 41. 37	N
	16. 2	C 1	6 ,,	67. 40. 36	N
	21. 2	B 1	9 ,,	67. 41. 20	N
	22. 0	D 1	3 ,,	67. 41. 22	N
	22. 2	D 2	3 ,,	67. 43. 8	N
	22. 22	B 2	9 ,,	67. 38. 11	N
	23. 0	C 2	6 ,,	67. 40. 53	N
	28. 2	B 1	9 ,,	67. 38. 30	N
March	7. 2	C 1	6 ,,	67. 38. 46	N
	13. 2	B 2	9 ,,	67. 36. 42	N
	15. 2	B 1	9 ,,	67. 37. 50	N
	17. 0	B 2	9 ,,	67. 38. 31	N
	17. 1	D 1	3 ,,	67. 41. 42	N
	23. 2	C 1	6 ,,	67. 41. 15	N
	23. 3	D 2	3 ,,	67. 44. 59	N
	27. 1	D 1	3 ,,	67. 41. 4	N
	27. 2	D 2	3 ,,	67. 40. 30	N
	28. 0	B 1	9 ,,	67. 39. 35	N
	28. 2	C 2	6 ,,	67. 40. 41	N
April	6. 0	C 2	6 ,,	67. 40. 9	N
	7. 1	D 1	3 ,,	67. 41. 58	N
	14. 2	D 2	3 ,,	67. 40. 43	N
	20. 0	B 1	9 ,,	67. 39. 11	N
	20. 2	C 1	6 ,,	67. 38. 53	N
	25. 0	B 2	9 ,,	67. 38. 50	N
	25. 2	C 2	6 ,,	67. 39. 33	N
	26. 22	C 1	6 ,,	67. 39. 52	N
	27. 0	D 2	3 ,,	67. 43. 42	N
	27. 3	C 1	6 ,,	67. 38. 46	N
	30. 2	D 1	3 ,,	67. 38. 43	N
May	4. 3	B 2	9 ,,	67. 40. 5	N
	8. 0	C 2	6 ,,	67. 42. 19	N
	8. 2	D 1	3 ,,	67. 40. 43	N
	22. 22	B 1	9 ,,	67. 41. 2	N
	23. 1	B 2	9 ,,	67. 36. 53	N
	23. 2	C 1	6 ,,	67. 37. 8	N
	24. 1	C 2	6 ,,	67. 40. 22	N
	24. 2	D 2	3 ,,	67. 41. 23	N

Day and Approximate Hour. 1877.		Needle.	Length of Needle.	Magnetic Dip.	Observer.
	d h			° ′ ″	
May	24. 22	B 1	9 inches	67. 37. 25	N
	25. 0	C 1	6 ,,	67. 38. 36	N
	25. 3	B 1	9 ,,	67. 37. 41	N
	31. 2	C 1	6 ,,	67. 41. 2	N
June	8. 0	C 2	6 ,,	67. 40. 34	N
	8. 2	D 1	3 ,,	67. 40. 17	N
	13. 2	D 2	3 ,,	67. 39. 36	N
	19. 2	B 2	9 ,,	67. 39. 9	N
	20. 0	B 1	9 ,,	67. 37. 33	N
	20. 2	C 2	6 ,,	67. 37. 33	N
	22. 2	C 1	6 ,,	67. 40. 43	N
	27. 0	B 2	9 ,,	67. 40. 8	N
	27. 1	B 1	9 ,,	67. 40. 33	N
	30. 0	C 2	6 ,,	67. 40. 25	N
	30. 2	C 1	6 ,,	67. 38. 13	N
July	4. 22	D 1	3 ,,	67. 39. 40	N
	5. 0	D 2	3 ,,	67. 39. 51	N
	5. 1	C 2	6 ,,	67. 39. 48	N
	5. 3	D 1	3 ,,	67. 37. 14	N
	7. 2	C 1	6 ,,	67. 38. 52	N
	10. 0	B 2	9 ,,	67. 41. 1	E
	17. 2	D 1	3 ,,	67. 38. 20	N
	25. 0	B 1	9 ,,	67. 37. 44	N
	25. 2	B 2	9 ,,	67. 36. 26	N
	26. 22	B 2	9 ,,	67. 38. 47	N
	27. 1	C 2	6 ,,	67. 40. 12	N
	27. 3	D 2	3 ,,	67. 41. 17	N
	30. 23	B 2	9 ,,	67. 40. 38	N
	31. 3	D 1	3 ,,	67. 38. 44	N
August	3. 2	B 1	9 ,,	67. 38. 43	N
	14. 1	C 2	6 ,,	67. 39. 20	N
	14. 2	D 1	3 ,,	67. 39. 51	N
	16. 23	C 1	6 ,,	67. 38. 22	N
	21. 1	B 2	9 ,,	67. 39. 50	N
	22. 2	D 2	3 ,,	67. 41. 41	N
	23. 2	C 2	6 ,,	67. 40. 57	N
	23. 23	B 1	9 ,,	67. 39. 16	N
	28. 23	B 1	9 ,,	67. 38. 50	N
	29. 0	C 1	6 ,,	67. 40. 52	N
	31. 0	D 1	3 ,,	67. 39. 25	N
	31. 2	D 2	3 ,,	67. 40. 9	N
September	7. 0	C 2	6 ,,	67. 39. 16	N
	7. 2	D 2	3 ,,	67. 40. 37	N
	14. 2	B 2	9 ,,	67. 40. 19	N
	19. 0	B 1	9 ,,	67. 40. 30	N
	21. 0	C 1	6 ,,	67. 39. 0	N
	21. 2	D 1	3 ,,	67. 40. 23	N
	25. 22	C 2	6 ,,	67. 41. 6	N
	25. 23	C 1	6 ,,	67. 40. 5	N
	26. 1	B 2	9 ,,	67. 36. 46	N
	26. 3	C 2	6 ,,	67. 39. 25	N
	28. 0	D 2	3 ,,	67. 40. 49	N

The initials E and N are those of Mr. Ellis and Mr. Nash respectively.

RESULTS of OBSERVATIONS of MAGNETIC DIP on each Day of Observation—*continued.*

Day and Approximate Hour, 1877	Needle.	Length of Needle.	Magnetic Dip.	Observer.
d h			° ′ ″	
October 6. 0	D 1	3 inches	67. 37. 35	N
17. 0	B 1	9 ,,	67. 37. 50	N
17. 2	C 1	6 ,,	67. 39. 59	N
19. 1	C 2	6 ,,	67. 39. 33	N
19. 2	D 2	3 ,,	67. 40. 20	N
26. 1	D 1	3 ,,	67. 40. 40	N
30. 0	B 2	9 ,,	67. 36. 13	N
31. 0	B 2	9 ,,	67. 35. 30	N
31. 1	B 1	9 ,,	67. 36. 59	N
31. 2	C 2	6 ,,	67. 38. 15	N
November 8. 1	B 1	9 ,,	67. 38. 23	N
8. 2	D 2	3 ,,	67. 40. 14	N
14. 1	C 1	6 ,,	67. 39. 4	N
19. 23	B 2	9 ,,	67. 40. 21	N
20. 2	D 2	3 ,,	67. 40. 42	N
26. 2	C 2	6 ,,	67. 37. 19	N
27. 1	B 2	9 ,,	67. 38. 2	N
27. 2	D 1	3 ,,	67. 40. 47	N
27. 23	C 2	6 ,,	67. 40. 46	N

Day and Approximate Hour, 1877.	Needle.	Length of Needle.	Magnetic Dip.	Observer.
d h			° ′ ″	
November 28. 2	C 1	6 inches	67. 38. 10	N
29. 22	B 1	9 ,,	67. 37. 30	N
30. 0	B 2	9 ,,	67. 37. 39	N
30. 3	B 1	9 ,,	67. 35. 49	N
December 8. 1	D 2	3 ,,	67. 39. 28	N
11. 23	D 1	3 ,,	67. 40. 45	N
12. 1	C 1	6 ,,	67. 38. 59	N
13. 1	B 1	9 ,,	67. 38. 20	N
13. 2	D 1	3 ,,	67. 40. 18	N
17. 2	D 2	3 ,,	67. 39. 21	N
18. 2	D 1	3 ,,	67. 37. 35	N
24. 2	C 2	6 ,,	67. 38. 59	N
26. 0	B 2	9 ,,	67. 36. 53	N
26. 22	D 2	3 ,,	67. 38. 31	N
27. 0	D 1	3 ,,	67. 36. 35	N
27. 2	B 1	9 ,,	67. 36. 55	N
27. 3	D 2	3 ,,	67. 38. 8	N
28. 1	C 1	6 ,,	67. 37. 38	N

The initial N is that of Mr. Nash.

MONTHLY MEANS OF MAGNETIC DIPS.

Month, 1877.	B 1, 9-inch Needle.	Number of Observations.	B 2, 9-inch Needle.	Number of Observations.	C 1, 6-inch Needle.	Number of Observations.
	° ′ ″		° ′ ″		° ′ ″	
January	67. 39. 57	2	67. 38. 47	1	67. 40. 24	3
February	67. 39. 55	2	67. 39. 54	2	67. 40. 36	1
March	67. 38. 43	2	67. 37. 37	2	67. 40. 1	2
April	67. 39. 11	1	67. 38. 50	1	67. 39. 10	3
May	67. 38. 43	3	67. 38. 29	2	67. 38. 55	3
June	67. 39. 3	2	67. 39. 39	2	67. 39. 28	2
July	67. 37. 44	1	67. 39. 18	4	67. 38. 52	1
August	67. 38. 56	3	67. 39. 50	1	67. 39. 37	2
September	67. 40. 30	1	67. 38. 32	2	67. 39. 33	2
October	67. 37. 25	2	67. 35. 52	2	67. 39. 59	1
November	67. 37. 14	3	67. 38. 41	3	67. 38. 37	2
December	67. 37. 37	2	67. 36. 53	1	67. 38. 18	2
Means	67. 38. 38	Sum 24	67. 38. 36	Sum 23	67. 39. 25	Sum 24

Month, 1877.	C 2, 6-inch Needle	Number of Observations.	D 1, 3-inch Needle.	Number of Observations.	D 2, 3-inch Needle.	Number of Observations.
	° ′ ″		° ′ ″		° ′ ″	
January	67. 41. 58	3	67. 42. 32	2	67. 42. 2	2
February	67. 40. 53	1	67. 41. 34	2	67. 43. 27	2
March	67. 40. 41	1	67. 41. 23	2	67. 42. 45	2
April	67. 39. 51	2	67. 40. 21	2	67. 42. 13	2
May	67. 41. 21	2	67. 40. 43	1	67. 41. 23	1
June	67. 39. 31	3	67. 40. 17	1	67. 39. 36	1
July	67. 40. 0	2	67. 38. 30	4	67. 40. 34	2
August	67. 40. 9	2	67. 39. 38	2	67. 40. 55	2
September	67. 39. 56	3	67. 40. 23	1	67. 40. 43	2
October	67. 38. 54	2	67. 39. 7	2	67. 40. 20	1
November	67. 39. 2	2	67. 40. 47	1	67. 40. 28	2
December	67. 38. 59	1	67. 38. 48	4	67. 38. 52	4
Means	67. 40. 8	Sum 24	67. 40. 1	Sum 24	67. 41. 0	Sum 23

For this table the monthly means have been formed without reference to the hour at which the observation was made on each day. In combining the monthly results, to form the annual means, weights have been given proportional to the number of observations.

YEARLY MEANS of MAGNETIC DIPS for each of the NEEDLES, and GENERAL MEAN for the Year 1877.

Lengths of the several Sets of Needles.	Needles.	Number of Observations with each Needle.	Mean Yearly Dips from Observations with each Needle.	Mean Yearly Dips from each Set of Needles.	Mean Yearly Dip from all the Sets of Needles.
			° ′ ″	° ′ ″	° ′ ″
9-inch Needles	B 1	24	67. 38. 38	67. 38. 37	67. 39. 38
	B 2	23	67. 38. 36		
6-inch Needles	C 1	24	67. 39. 25	67. 39. 47	
	C 2	24	67. 40. 8		
3-inch Needles	D 1	24	67. 40. 1	67. 40. 30	
	D 2	23	67. 41. 0		

RESULTS of OBSERVATIONS of MAGNETIC DIP at the Hours of Observation 9h. a.m. and 3h. p.m.

Month and Day, 1877.	Needle.	Length of Needle.	Magnetic Dip. At 9h. a.m. ±	Magnetic Dip. At 3h. p.m. ±	Excess of the Magnetic Dip at 9h. a.m. over the Magnetic Dip at 3h. p.m.
			° ′ ″	° ′ ″	′ ″
January 24	D 2	3 inches	67. 43. 10	67. 40. 53	+ 2. 17
April 27	C 1	6 ,,	67. 39. 52	67. 38. 46	+ 1. 6
May 25	B 1	9 ,,	67. 37. 25	67. 37. 41	− 0. 16
July 5	D 1	3 ,,	67. 39. 40	67. 37. 14	+ 2. 26
September 26	C 2	6 ,,	67. 41. 6	67. 39. 25	+ 1. 41
November 30	B 1	9 ,,	67. 37. 30	67. 35. 49	+ 1. 41
December 27	D 2	3 ,,	67. 38. 31	67. 38. 8	+ 0. 23
Mean	....		....	....	+ 1. 20

ROYAL OBSERVATORY, GREENWICH.

OBSERVATIONS

OF

DEFLEXION OF A MAGNET

FOR

ABSOLUTE MEASURE

OF

HORIZONTAL FORCE.

1877.

Abstract of the Observations of Deflexion of a Magnet for Absolute Measure of Horizontal Force.

Month and Day, 1877.		Distances of Centers of Magnets.	Temperature.	Observed Deflexion.	Mean of the Times of Vibration of Deflecting Magnet.	Number of Vibrations.	Temperature.	Observer.
		ft.	°	° ′ ″	s		°	
January	30	1·0 1·3	50·1	11. 9. 43 5. 3. 35	5·565 5·570	100 100	51·9 50·8	N
February	27	1·0 1·3	41·6	11. 9. 32 5. 3. 40	5·564 5·562	100 100	43·1 41·1	N
March	29	1·0 1·3	56·3	11. 7. 50 5. 2. 47	5·576 5·563	100 100	54·3 58·7	N
April	27	1·0 1·3	51·9	11. 9. 12 5. 3. 34	5·567 5·560	100 100	52·0 52·4	N
May	30	1·0 1·3	64·7	11. 7. 25 5. 2. 50	5·573 5·575	100 100	65·1 66·3	N
June	26	1·0 1·3	69·3	11. 5. 18 5. 1. 32	5·576 5·570	100 100	68·6 69·8	N
July	26	1·0 1·3	68·8	11. 4. 26 5. 1. 10	5·572 5·574	100 100	68·3 70·1	N
August	30	1·0 1·3	67·0	11. 4. 53 5. 1. 29	5·583 5·579	100 100	67·1 67·7	N
September	28	1·0 1·3	62·9	11. 4. 45 5. 1. 20	5·580 5·581	100 100	63·1 63·6	N
October	30	1·0 1·3	58·7	11. 4. 29 5. 1. 17	5·584 5·582	100 100	59·3 59·9	N
November	29	1·0 1·3	47·2	11. 4. 36 5. 1. 34	5·579 5·577	100 100	47·9 47·7	N
December	28	1·0 1·3	38·8	11. 5. 19 5. 1. 39	5·572 5·576	100 100	39·0 41·3	N

The position of the Deflecting Magnet with regard to the suspended Magnet is always that which was formerly termed "Lateral." The Deflecting Magnet is placed on the East side of the suspended Magnet, with its marked pole alternately E. and W., and it is placed on the West side with its pole alternately E. and W.; and the deflexion in the table above is the mean of the four deflexions observed in those positions of the magnets.

The lengths of 1 foot and 1·3 foot answer to 304·8 and 396·2 millimètres respectively.

The initial N is that of Mr. Nash.

In the following calculations every observation is reduced to the temperature 35°.

COMPUTATION of the VALUES of ABSOLUTE MEASURE of HORIZONTAL FORCE in the Year 1877.

Month and Day, 1877.		In English Measure.									Value of X in Metric Measure.
		Apparent Value of A_1.	Apparent Value of A.	Apparent Value of P.	Mean Value of P.	Log. $\frac{m}{X}$	Adopted Time of Vibration of Deflecting Magnet.	Log. m X.	Value of X	Value of m	
January	30	0·09702	0·09711	−0·00209	−0·00276	8·98802	5·5675	0·16923	3·896	0·3790	1·796
February	27	0·09686	0·09700	−0·00338		8·98740	5·5630	0·16935	3·899	0·3788	1·798
March	29	0·09686	0·09695	−0·00243		8·98730	5·5695	0·16928	3·894	0·3787	1·798
April	27	0·09698	0·09713	−0·00384		8·98797	5·5635	0·16994	3·899	0·3793	1·798
May	30	0·09694	0·09711	−0·00440		8·98783	5·5740	0·16928	3·897	0·3789	1·797
June	26	0·09671	0·09677	−0·00152		8·98657	5·5730	0·16954	3·904	0·3785	1·800
July	26	0·09658	0·09665	−0·00175		8·98600	5·5730	0·16970	3·907	0·3783	1·801
August	30	0·09661	0·09672	−0·00259		8·98622	5·5810	0·16887	3·902	0·3780	1·799
September	28	0·09652	0·09660	−0·00197		8·98577	5·5805	0·16799	3·900	0·3775	1·798
October	30	0·09642	0·09651	−0·00248		8·98532	5·5830	0·16732	3·899	0·3770	1·798
November	29	0·09625	0·09641	−0·00429		8·98471	5·5780	0·16730	3·902	0·3767	1·799
December	28	0·09621	0·09631	−0·00243		8·98440	5·5740	0·16735	3·904	0·3766	1·800
Means........		..	..	..	..	..	..	..	3·901	..	1·799

The value of X in column 9 is referred to the unit Foot-Grain-Second, and that in column 11 to the unit Millimètre-Milligramme-Second. To obtain X in the Centimètre-Gramme-Second (C.G.S.) unit, the value given in column 11 must be divided by 10, equivalent to shifting the decimal point one step towards the left.

ROYAL OBSERVATORY, GREENWICH.

RESULTS

OF

METEOROLOGICAL OBSERVATIONS.

1877.

MONTH and DAY 1877	Phases of the Moon	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit)	TEMPERATURE. Of the Air. Highest	Lowest	Daily Range	Mean of 24 Hourly Values	Excess of Mean above Average of 20 Years	Of Evaporation. Mean of 24 Hourly Values	Of the Dew Point. Deduced Mean Daily Value	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value	Greatest of 24 Hourly Values	Least of 24 Hourly Values	Degree of Humidity (Saturation = 100)	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer	Of the Water of the Thames off Greenwich. Highest	Lowest	Daily Duration of Sunshine	Sun above Horizon	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground	Daily Amount of Ozone	Electricity
											°	°		°	°	°	°	hours	hours	in.		
Jan. 1	..	[illegible]	53·4	42·0	11·4	[illegible]	+ 11·8	47·5	44·9	5·0	10·0	2·1	84	62·9	42·0	44·5	42·5	0·7	7·9	0·119	9·3	0
2	..	[illegible]	42·0	35·3	6·7	38·6	+ 0·7	37·3	35·5	3·1	6·8	0·5	90	66·3	34·2	46·9	44·7	0·0	7·9	0·316	3·3	0
3	..	[illegible]	[illegible]	37·7	13·0	45·8	+ 8·[illegible]	44·9	43·9	1·9	5·6	0·0	94	55·3	36·6	48·3	45·3	0·0	7·9	0·267	8·0	0
4	..	[illegible]	51·2	40·7	[illegible]	49·1	+ 11·4	47·9	46·6	2·5	4·1	1·1	91	56·2	42·0	46·6	44·3	0·0	7·9	0·280	5·5	0
5	In Equator	[illegible]	52·5	43·6	8·9	47·0	+ 9·1	45·0	42·8	4·2	7·5	1·3	86	77·9	38·1	46·3	44·8	1·3	7·9	0·065	5·5	0
6	Last Qr.	[illegible]	[illegible]	40·4	10·3	46·[illegible]	+ 8·4	44·5	42·8	3·2	6·7	0·7	89	53·3	35·0	46·3	44·5	0·0	8·0	0·235	17·5	0
7	..	[illegible]	52·1	44·9	7·2	48·7	+ 11·1	46·3	43·7	5·0	9·6	2·1	83	80·1	41·0	46·3	44·1	0·3	8·0	0·309	12·7	0
8	..	[illegible]	50·9	44·6	6·3	48·6	+ 10·9	48·0	47·3	1·3	4·6	0·0	96	53·2	41·0	46·3	44·3	0·0	8·0	0·536	6·0	0
9	..	[illegible]	52·5	41·0	11·5	47·5	+ 9·8	46·6	45·6	1·9	5·6	0·0	94	76·0	37·0	46·3	44·8	0·0	8·1	0·289	0·0	0
10	..	[illegible]	46·0	35·8	10·2	42·0	+ 4·2	41·9	41·8	0·2	2·2	0·0	99	48·7	33·4	47·1	45·3	0·0	8·1	0·504	1·0	0
11	..	29·512	43·4	36·4	7·0	38·9	+ 1·0	37·9	36·6	2·3	3·8	0·9	93	43·4	36·0	46·3	44·3	0·0	8·1	0·320	0·0	0
12	[illegible]	29·674	36·4	28·5	7·[illegible]	32·5	− 5·6	32·0	31·0	1·5	4·8	0·0	95	37·0	24·5	45·1	42·1	0·0	8·2	0·000	0·0	0
13	..	[illegible]	42·1	30·9	11·2	36·5	− 1·7	35·0	32·9	3·6	7·5	0·8	87	62·9	30·8	42·3	39·5	1·0	8·2	0·000	0·0	0
14	New	[illegible]	49·2	37·5	11·7	44·7	+ 6·4	44·2	43·6	1·1	2·8	0·0	96	53·0	36·2	40·3	39·1	0·0	8·2	0·276	1·3	0
15	Apogee	29·819	43·4	35·5	7·9	39·8	+ 1·4	37·5	34·5	5·3	9·2	0·7	82	59·4	30·8	42·5	39·5	0·8	8·3	0·010	5·5	0
16	..	29·910	51·3	41·5	9·8	47·0	+ 8·5	45·7	44·3	2·7	5·7	0·0	91	77·2	33·9	41·5	40·3	0·0	8·3	0·000	6·7	0
17	..	29·70[illegible]	51·1	42·5	8·6	48·9	+ 10·3	48·3	47·7	1·2	3·8	0·0	96	55·6	38·5	42·8	40·3	0·0	8·3	0·043	10·7	0
18	..	29·64[illegible]	51·0	39·0	12·0	45·6	+ 6·8	44·9	44·1	1·5	5·3	0·0	95	53·0	35·0	45·3	41·8	0·0	8·4	0·023	15·5	0
19	In Equator	29·67[illegible]	56·1	47·4	8·7	51·7	+ 12·8	49·9	48·2	3·5	8·4	0·4	88	58·6	41·8	46·3	43·3	0·0	8·4	0·042	9·3	0
20	..	30·18[illegible]	46·6	34·5	12·1	43·1	+ 4·0	41·8	40·2	2·9	6·4	0·0	90	51·3	30·6	48·3	45·3	0·0	8·5	0·000	0·0	0
21	..	30·451	49·0	27·7	21·3	38·2	− 1·1	37·2	35·8	2·4	8·4	0·0	91	82·6	25·4	48·3	45·8	3·1	8·5	0·000	0·4	0
22	First Qr.	[illegible]	44·7	30·5	14·2	36·5	− 3·0	35·6	34·4	2·1	5·3	0·0	92	69·0	25·0	47·3	44·8	0·4	8·6	0·000	1·1	0
23	..	[illegible]	47·2	29·3	17·9	38·0	− 1·6	34·8	30·4	7·6	14·9	0·0	74	88·2	23·8	45·8	42·5	5·4	8·6	0·000	0·5	0
24	..	[illegible]	45·8	32·6	13·2	40·9	+ 1·2	38·1	34·6	6·3	12·2	0·9	79	63·9	27·9	44·5	41·5	2·3	8·7	0·070	2·7	0
25	..	[illegible]	[illegible]	34·5	[illegible]	42·2	+ 2·4	40·9	39·3	2·9	6·4	1·0	90	54·4	29·8	42·3	39·3	0·0	8·7	0·299	3·7	0
26	[illegible]	[illegible]	[illegible]	31·7	[illegible]	36·6	− 3·3	34·5	31·5	5·1	9·7	1·0	82	56·5	27·2	41·8	39·5	0·0	8·8	0·000	0·0	0
27	..	[illegible]	[illegible]	[illegible]	[illegible]	39·1	− 0·9	38·4	37·5	1·6	6·5	0·0	94	52·2	23·1	41·3	39·3	0·0	8·8	0·032	0·3	0
28	..	[illegible]	[illegible]	[illegible]	16·2	[illegible]	+ 2·9	[illegible]	38·6	4·4	11·6	0·0	84	66·0	31·2	41·1	38·9	0·0	8·9	0·022	1·1	0
29	..	[illegible]	49·4	34·5	14·9	41·4	+ 1·2	38·5	34·9	6·5	11·0	2·6	78	70·7	28·8	41·3	39·1	1·6	8·9	0·009	3·1	0
30	..	[illegible]	[illegible]	[illegible]	10·6	42·6	+ 2·3	40·2	37·3	5·3	12·3	0·7	82	74·7	30·0	41·3	39·3	1·8	9·0	0·116	6·0	0
31	..	[illegible]	42·7	33·7	9·0	38·7	− 1·7	36·7	34·0	4·7	8·1	0·7	84	51·5	26·0	42·3	39·8	0·0	9·0	0·165	0·0	0
Means	..	[illegible]	[illegible]	36·8	11·3	42·9	+ 4·1	41·4	39·6	3·3	7·3	0·6	88·7	61·6	32·8	44·6	42·3	0·6	8·4	Sum 4·347	4·4	..
Number of Column for Reference	[illegible]	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The readings [illegible] except those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean daily [illegible] between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on January 22 for the Barometer, on January 6, 16, 21, and 30 for Air Temperature, and on January 5, 6, 16, and 21 for Evaporation Temperature, depend partly on values inferred from eye-observations [illegible] of accidental loss of photographic register.

The values given in Columns [illegible] 5, 14, 15, 16, and 17 are derived from eye readings of self-registering thermometers.

The mean reading of the Barometer for the month was 29in·768, being 0in·061 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 56°·1 on January 19; the lowest in the month was 27°·7 on January 21; and the range was 28°·4.
The mean of all the highest daily readings in the month was 48°·1, being 4°·7 *higher* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 36°·8, being 3°·1 *higher* than the average for the 36 years, 1841–1876.
The mean daily range was 11°·3, being 1°·6 *greater* than the average for the 36 years, 1841–1876.
The mean for the month was 42°·9, being 4°·1 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Jan. 1	S : SW	SW : WSW	17·8	0·0	1·4	399	10, r : 10, r, st.-w	8,cu.-s,ci.-cu,sc,st.-w : v, r : 10
2	N : NNE	ESE	3·2	0·0	0·2	244	r : 8, ci.-cu, cu.-s	4,ci,ci.-cu,ci.-s,cu.-s,so.-ha : 10, h.-r, w
3	E : ESE	SSE : S	7·5	0·0	0·5	346	10, r, w : 10, r	10, r : 10 : 10, r
4	SSW	SSW : SW	1·0	0·0	0·1	350	10, r : 10, r	10 : 10 : 0
5	SW	SSW : SW	3·4	0·0	0·4	427	0 : 3, ci, ci.-cu	v, cu.-s, r : v
6	WSW : SW	S : SSW	13·0	0·0	1·7	569	v : 10, r	10, r : 10, r, w : v, st.-w
7	SSW : S	SSW : SW	12·3	0·0	2·1	583	10, r : 10, r, w : 0,cu.-s,ci.-cu,ci,st.-w	10, r, w : 10, r : v, l, w
8	SSW : S	S : SW	3·1	0·0	0·3	248	v : 10, r	10, r : v
9	S : W : SW	SW : SSW	2·5	0·0	0·1	263	10, r	4,cu.-s,cu,ci,th.-r : v : 0
10	SSW : NE	ENE	10·0	0·0	0·5	292	v : 10, f	10 : 10, r : 10, r, w
11	ENE : NE	NNE : N	13·0	0·0	1·6	526	10, r, w	10, r
12	NW : W : SW	Variable	0·0	0·0	0·0	108	ci, ci.-cu, mt, h.-fr	10, f : v, f
13	Variable	SW : SSE	0·0	0·0	0·0	117	10, mt : v	3, ci, ci.-cu : 10 : 10
14	SE : S	S: SW : W: NW	7·4	0·0	0·2	322	10, r	10, r : r, sq
15	WNW : W	WNW: W: SW: S	1·8	0·0	0·1	346	sl.-r : 1, ci	1, ci, ci.-s, cu : v, ci, ci.-s : 5, cu, ci.-cu
16	SSW : SW	SW : SSW	1·6	0·0	0·1	392	v	9, cu.-s, ci.-cu : 10, sl.-r
17	SSW	SSW : SW : W	2·9	0·0	0·3	339	10 : 10, th.-r	10, oc.-r
18	SSW : S	SSW	4·2	0·0	0·7	410	10	10, r, hl : 10, th.-r : 10, th.-r
19	SW	SW : W	13·0	0·0	1·8	623	10, th.-r	10, m.-r, st.-w : v, m.-r, w : v
20	WSW : NE	N : NNE : SW	0·0	0·0	0·0	125	10, mt	10 : 0, h.-d, f, mt, h.-fr
21	SW : S	SSW	0·0	0·0	0·0	153	th.-f, h.-fr	1, ci : lu.-ha
22	SSW : S	SSW : SSE	0·0	0·0	0·0	177	10, li.-cl, h.-fr : v, so.-ha	6, ci, ci.-cu, ci.-s, cu.-s : v, sl.-f, h.-fr
23	SSE : S	SSE : SSW	1·9	0·0	0·1	214	h.-fr : 0	1, ci : v, cu.-s, cu
24	SSW : SW : W	NW : W : SW : S	2·5	0·0	0·2	321	v : r : v	5, ci, ci.-cu, h : 0,lu.-ha,h.-fr,h,sl.-f
25	SSE : SSW	SSW : NW : W	8·0	0·0	0·4	410	10, r	10, r, gt.-glm, sq : 0
26	W : WSW	NW : WSW	1·9	0·0	0·1	329	0, mt, h.-fr	3, ci, ci.-cu, mt : 0 : 0, f
27	SW : SSW	SW:W:WNW:WSW	2·2	0·0	0·1	268	10, r	10, r : 7, sl.-f, h
28	SSW	SW : WSW	7·7	0·0	1·0	468	10 : 10, th.-r	v, ci.-cu, ci, sh.-r, w : v, l, w
29	W : WSW	WSW	13·7	0·2	2·5	724	0, w	10, r, w : 10, r, st.-w : 7, ci.-cu, cu.-s, st.-w
30	WSW	WNW : NW	24·0	0·0	4·2	893	10, r, st.-w : 10, r, g, hl, sn, st.-w	5, ci.-cu, cu.-s, st.-w : v, w
31	WNW : W	WSW : SSW : S	0·5	0·0	0·0	290	0, h. mt, so.-ha	10 : 10, r
Means	...	...	..	..	0·7	370		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 41°·4, being 4°·0 *higher* than
The mean *Temperature of the Dew Point* for the month was 39°·6, being 4°·2 *higher* than
The mean *Degree of Humidity* for the month was 88·7, being 1·4 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·243, being 0in·036 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2grs·8, being 0gr·4 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 547 grains, being 5 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·8.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·07. The maximum daily amount of *Sunshine* was 5·4 hours on January 23.

The highest reading of the *Solar Radiation Thermometer* was 88°·2 on January 23; and the lowest reading of the *Terrestrial Radiation Thermometer* was 23°·1 on January 27.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·0; for the six hours ending 3 p.m., 0·8; and for the six hours ending 9 p.m., 0·6.

The *Proportions of Wind* referred to the cardinal points were N. 2, E. 2, S. 15, and W. 11. One day was calm.

The *Greatest Pressure of the Wind* in the month was 24lbs·0 on the square foot on Jan. 30. The mean daily *Horizontal Movement of the Air* for the month was 370 miles; the greatest daily value was 893 miles on January 30; and the least daily value 108 miles on January 12.

Rain fell on 23 days in the month, amounting to 4in·347, as measured in the simple cylinder gauge partly sunk below the ground; being 2in·269 *greater* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	PHASES OF THE MOON.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours	hours	in		
Feb. 1	In Equator	29·823	49·5	39·3	10·2	47·3	+ 6·8	46·1	44·8	2·5	6·3	0·2	92	53·6	37·8	41·3	39·7	0·0	9·1	0·047	0·0	o
2	..	29·888	50·6	42·0	8·6	48·1	+ 7·5	46·9	45·6	2·5	7·0	0·6	92	58·5	38·0	43·3	40·3	0·0	9·2	0·053	0·0	o
3	..	30·011	49·5	34·9	14·6	43·0	+ 2·3	40·3	37·1	5·9	11·8	2·9	80	87·5	30·5	44·3	41·3	1·9	9·2	0·000	0·7	o
4	..	29·708	46·0	33·5	12·5	41·8	+ 1·1	38·8	35·1	6·7	12·0	2·9	79	62·8	29·8	44·1	41·8	0·1	9·3	0·010	2·3	o
5	Last Qr.	30·158	49·3	32·1	17·2	42·6	+ 2·0	40·6	38·2	4·4	7·3	2·2	85	71·6	28·0	43·3	42·3	0·0	9·3	0·000	0·7	o
6	..	30·082	52·5	46·6	5·9	49·7	+ 9·3	48·1	46·4	3·3	4·2	1·5	89	58·3	44·8	43·8	42·3	0·0	9·4	0·015	3·3	o
7	..	29·975	59·1	47·0	12·1	51·9	+ 11·7	49·3	46·7	5·2	10·6	1·3	83	78·8	46·0	44·8	42·8	0·0	9·4	0·037	3·0	o
8	Greatest Declination S.	30·007	52·0	40·0	12·0	46·4	+ 6·5	43·5	40·2	6·2	13·2	0·4	80	87·3	33·0	46·3	43·7	2·2	9·5	0·000	0·0	o
9	..	29·895	53·4	37·6	15·8	45·8	+ 6·2	43·6	41·1	4·7	6·8	2·8	84	65·2	29·1	46·3	44·3	0·0	9·6	0·000	0·5	o
10	..	29·758	52·9	46·9	6·0	50·1	+ 10·8	47·9	45·6	4·5	6·1	3·4	85	67·9	43·0	47·3	44·7	0·0	9·6	0·000	2·7	o
11	Apogee	29·718	54·6	44·1	10·5	49·2	+ 10·1	45·7	42·0	7·2	15·6	1·9	76	91·0	39·0	48·3	45·8	5·3	9·7	0·074	5·5	o
12	..	29·627	54·0	44·7	9·3	47·6	+ 8·7	45·3	42·8	4·8	11·1	1·9	85	60·2	38·3	48·3	46·3	0·0	9·8	0·290	8·7	o
13	New	29·602	50·9	43·0	7·9	46·3	+ 7·5	45·1	43·8	2·5	5·3	0·2	92	58·5	40·8	48·3	46·7	0·0	9·8	0·299	6·5	o
14	..	29·821	53·5	43·8	9·7	49·7	+ 11·0	47·7	45·6	4·1	8·4	0·0	87	61·2	43·0	48·5	46·7	0·0	9·9	0·085	0·0	o
15	..	29·734	51·1	45·3	5·8	48·2	+ 9·5	46·0	43·6	4·6	7·8	1·3	85	60·3	39·9	48·8	47·1	0·0	9·9	0·000	0·4	o
16	In Equator	29·622	49·3	36·9	12·4	44·1	+ 5·3	40·9	37·2	6·9	12·4	0·0	76	78·8	31·0	49·1	47·3	3·5	10·0	0·030	1·1	o
17	..	29·869	49·4	37·3	12·1	42·7	+ 3·8	39·5	35·6	7·1	11·8	3·8	77	71·3	31·0	47·8	46·3	0·5	10·1	0·000	0·0	o
18	..	29·893	49·2	39·5	9·7	44·9	+ 5·9	43·5	41·9	3·0	5·7	1·1	89	54·8	34·0	47·3	45·8	0·0	10·1	0·068	0·0	o
19	..	29·639	48·0	38·5	9·5	43·2	+ 4·0	40·3	36·8	6·4	13·2	1·3	78	84·0	34·3	47·1	45·3	3·6	10·2	0·209	1·3	o
20	..	29·104	45·3	34·0	11·3	39·9	+ 0·6	36·8	32·8	7·1	15·0	0·7	76	64·5	31·0	46·8	45·3	1·5	10·3	0·205	3·7	o
21	First Qr.	29·604	41·5	35·5	6·0	38·8	− 0·7	35·4	30·9	7·9	9·7	4·1	73	59·2	29·8	45·5	43·8	0·4	10·3	0·000	0·0	o
22	Greatest Declination N.	29·769	40·8	33·3	7·5	36·8	− 2·8	34·7	31·7	5·1	9·9	1·0	83	66·8	29·7	44·3	42·3	1·0	10·4	0·087	0·5	o
23	..	29·719	45·4	33·0	12·4	38·5	− 1·2	36·1	32·9	5·6	9·2	1·5	81	89·9	29·8	43·3	41·3	3·3	10·5	0·056	1·5	w
24	..	29·513	50·5	36·4	14·1	44·5	+ 4·7	42·4	39·9	4·6	7·6	2·0	84	62·4	30·7	42·5	40·8	0·0	10·5	0·054	1·5	w : o
25	..	29·27[illegible]	55·2	44·0	11·2	47·6	+ 7·7	44·1	40·1	7·5	10·8	5·1	76	90·8	38·6	42·8	40·8	2·0	10·6	0·008	6·3	o
26	Perigee	29·272	45·2	32·0	13·2	40·3	+ 0·3	36·8	32·3	8·0	13·6	2·6	73	64·6	26·0	44·1	41·7	0·9	10·7	0·081	5·2	sN : o
27	Full	29·7[illegible]	39·9	27·0	12·[illegible]	32·9	− 7·2	29·8	23·5	9·4	15·6	1·8	68	73·0	22·0	43·3	41·7	3·5	10·7	0·002	2·0	w
28	In Equator	30·034	39·2	24·7	14·5	31·2	− 9·0	28·8	22·6	8·6	16·3	0·0	69	85·0	19·0	42·3	40·3	6·7	10·8	0·000	3·0	o
Means	..	29·752	49·2	38·3	10·9	44·0	+ 4·4	41·6	38·5	5·6	10·2	1·7	81·3	70·3	33·9	45·5	43·5	1·3	9·9	Sum 1·710	2·2	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9 a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on February 1 for Air and Evaporation Temperatures depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The mean reading of the Barometer for the month was 29in·752, being 0in·080 [illegible] than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 59°·1 on February 7; the lowest in the month was 24°·7 on February 28; and the range was 34°·4.

The mean of all the highest daily readings in the month was 49°·2, being 3°·8 *higher* than the average for the 36 years, 1841–1876.

The mean of all the lowest daily readings in the month was 38°·3, being 4°·2 *higher* than the average for the 36 years, 1841–1876.

The mean daily range was 10°·9, being 0°·4 *less* than the average for the 36 years, 1841–1876.

The mean for the month was 44°·0, being 4°·4 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	Wind as deduced from Self-Registering Anemometers. — Osler's. — General Direction. — A.M.	P.M.	Osler's. Pressure on the Square Foot. — Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. — A.M.	Clouds and Weather. — P.M.
			lbs.	lbs.	lbs.	miles.		
Feb. 1	WSW	WSW : SW	0·3	0·0	0·0	278	10, r : 10	10 : 10
2	WSW : SW	SSW : WSW	4·8	0·0	0·6	406	10	10 : 10, r : 0
3	SW	SW	3·4	0·0	0·4	397	0 : v, ci.-cu, so.-ha	7, ci, ci.-cu, cu.-s : v
4	WSW : W	WNW : SW	2·6	0·0	0·2	363	v, sl.-r : 1, ci.-cu	7, cu.-s, cu, ci : 0, h.-fr
5	SW	SW	1·9	0·0	0·2	363	v : 9, cu.-s, ci.-s	10 : 10, r : 10, r
6	WSW	SW	1·7	0·0	0·2	409	10, th.-r	10, th.-r : 10, th.-r : 1
7	WSW	W : NNW	4·5	0·0	1·0	499	v : 6, cu.-s, ci.-cu	10 : 10, r : 10, fr.-shs
8	WSW:NNE:NW	WNW:W:WSW	1·8	0·0	0·1	211	v, sl.-f : 7, ci, cu, cu.-s, th.-f	v, ci.-cu, cu.-s : v
9	W : WSW	WSW	3·0	0·0	0·5	371	v, cu.-s, ci.-cu	10 : v, ci.-cu, ci.-s : 9
10	WSW : W	W	6·3	0·0	0·9	530	10 : 10, ci.-cu, ci.-s	10, th.-r : 10
11	WSW : W	W : WSW	18·5	0·1	2·1	561	10, r, w : 7, ci.-cu, cu.-s, st.-w	v, ci, ci.-cu, st.-w : 0
12	WSW : SW	WSW : WNW	6·8	0·0	1·1	484	v : 10, r	10, r : v : 10
13	WSW	WSW: NE: SSW	1·8	0·0	0·1	245	10	10, r : 10, c.-r
14	SSW : WSW	WSW : SW	3·2	0·0	0·2	297	10, r : 10	10 : 10
15	SW : SSW	SSW	2·5	0·0	0·2	336	10	10 : 10 : 5
16	SW : NW : W	W : WSW	3·3	0·0	0·3	397	10, r : 3, ci.-cu, h	5, ci, cu, cu.-s : 0 : 0
17	WSW : W	NW : WSW	2·7	0·0	0·2	370	0 : 9, ci.-cu, cu.-s	8, ci.-cu, cu.-s : v, cu.-s, mt
18	WSW	WSW : SW	1·2	0·0	0·0	290	v	10, r : 10, r
19	WSW : WNW	W : SW	3·8	0·0	0·3	377	10, r : 10, r : v, ci, ci.-cu	v, ci,ci.-cu,cu : 10, r : 10, r
20	W : NNW	NW	27·5	0·1	4·3	706	10, h.-r, l, st.-w : 10, h.-r, su, g	v, ci.-cu, st.-w : v, w
21	NNW	N	7·7	0·1	1·4	431	v, w	10 : v, cu.-s.ci.-cu: v,cu.-s,ci.-cu
22	N	NW:WNW:WSW:N	2·7	0·0	0·4	321	v : 10, th.-cl	10, cu.-s, cu : 10, sn, sl, r : 10
23	NE : NNE	N:NNW:WSW	3·8	0·0	0·5	303	10, r : 1, ci	10 : 10 : v
24	WSW	W : WSW	4·2	0·0	0·7	439	10, r	10
25	W : WSW	WSW	11·3	0·1	1·9	633	10, oc.-th.-r, w	v, oc.-shs, w : lu.-co, w
26	WSW : N	N : NW : WSW	12·0	0·0	2·3	564	v, st.-w : 10, sn, st.-w	v, ci.-cu, ci, su, w : 0
27	NW : W : WSW	NNW	13·4	0·0	1·7	454	v, st.-w	v, cu.-s, ci.-cu, w : 0
28	NW: WNW: NNW	NNW	5·2	0·0	1·0	375	0, h.-fr : 3, ci.-s	3, ci, ci.-cu : 3,ci,ci.-cu,cu.-s: 0
Means	...	...	..	..	0·8	408		
Number of Column for Reference.	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 41°·6, being 3°·7 *higher* than
The mean *Temperature of the Dew Point* for the month was 38°·5, being 5°·1 *higher* than
The mean *Degree of Humidity* for the month was 81·3, being 3·5 *less* than
The mean *Elastic Force of Vapour* for the month was 0in·233, being 0in·026 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2grs·7, being 0gr·3 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 547 grains, being 7 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·4.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·13. The maximum daily amount of *Sunshine* was 6·7 hours on February 28.

The highest reading of the *Solar Radiation Thermometer* was 91°·0 on February 11; and the lowest reading of the *Terrestrial Radiation Thermometer* was 19°·0 on February 28.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 1·8; for the six hours ending 3 p.m., 0·2; and for the six hours ending 9 p.m., 0·2.

The *Proportions of Wind* referred to the cardinal points were N. 5, E. 0, S. 6, and W. 17.

The *Greatest Pressure of the Wind* in the month was 27lb·5 on the square foot on February 20. The mean daily *Horizontal Movement of the Air* for the month was 408 miles; the greatest daily value was 706 miles on February 20; and the least daily value 211 miles on February 8.

Rain fell on 18 days in the month, amounting to 1in·710, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·329 *greater* than the average fall for the 36 years, 1841–1876.

MONTH and DAY. 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours.	hours.	in.		
Mar. 1	..	30·194	40·0	23·5	16·5	32·0	− 8·3	29·6	24·0	8·0	16·3	0·0	71	62·8	18·2	41·3	39·3	3·9	10·8	0·000	1·5	o
2	..	30·055	54·4	35·8	18·6	45·7	+ 5·3	44·5	43·1	2·6	4·8	0·2	91	71·6	31·2	40·5	39·1	0·0	10·9	0·188	5·3	o
3	..	29·940	52·0	45·3	6·7	48·0	+ 7·5	46·4	44·6	3·4	8·0	0·8	89	67·5	42·9	41·3	39·3	0·0	11·0	0·026	2·5	w:
4	..	29·714	45·0	40·0	5·0	43·1	+ 2·6	42·4	41·6	1·5	3·9	0·0	94	47·8	39·0	42·3	40·3	0·0	11·1	0·391	7·3	o: N
5	..	29·714	46·2	34·6	11·6	39·8	− 0·7	37·3	34·1	5·7	11·0	3·1	80	69·0	29·7	43·3	41·1	3·0	11·1	0·000	1·5	o
6	Last Qr.	29·696	43·1	32·8	10·3	37·3	− 3·2	35·2	32·3	5·0	8·5	2·6	83	52·7	28·8	43·5	41·3	0·0	11·2	0·000	0·0	o
7	Greatest Declination S.	29·275	42·1	33·3	8·8	37·1	− 3·5	35·2	32·6	4·5	9·7	1·9	84	68·5	28·0	43·5	41·8	1·4	11·2	0·083	0·3	o
8	..	29·741	41·7	31·3	10·4	35·2	− 5·4	32·8	29·0	6·2	11·7	2·9	78	80·3	24·8	43·3	41·1	5·4	11·3	0·000	0·7	o
9	..	29·920	41·6	30·5	11·1	35·6	− 5·1	33·5	30·3	5·3	9·1	0·0	81	63·2	26·4	42·3	40·3	2·4	11·4	0·000	6·5	o
10	Apogee	29·939	39·0	27·5	11·5	33·4	− 7·3	30·9	26·2	7·2	15·8	4·1	74	95·0	26·5	41·7	39·5	5·2	11·4	0·000	9·5	o
11	..	30·031	42·0	24·8	17·2	33·0	− 7·8	30·1	24·3	8·7	16·1	4·1	70	95·2	23·2	41·1	38·9	9·6	11·5	0·000	1·5	w
12	..	29·707	48·2	30·4	17·8	40·8	0·0	38·7	36·0	4·8	9·2	0·0	84	57·8	26·8	41·1	38·7	0·0	11·6	0·003	4·5	o
13	..	29·617	48·5	41·8	6·7	46·1	+ 5·2	43·1	39·7	6·4	10·9	1·5	79	61·0	34·6	40·9	38·9	0·0	11·6	0·020	0·0	o
14	..	29·739	54·7	43·0	11·7	49·7	+ 8·7	46·0	42·1	7·6	11·4	3·4	75	92·7	36·9	41·5	39·3	2·8	11·7	0·002	0·0	o
15	New In Equator.	29·689	51·9	37·5	14·4	45·2	+ 4·1	42·1	38·5	6·7	12·4	1·5	78	79·6	33·7	42·7	40·3	2·7	11·8	0·000	1·3	o
16	..	29·391	50·2	35·5	14·7	42·4	+ 1·2	37·7	32·0	10·4	20·6	4·6	68	99·9	28·6	43·9	41·3	6·2	11·8	0·000	5·3	o
17	..	29·429	47·8	30·7	17·1	37·8	− 3·5	34·8	30·7	7·1	15·4	1·8	77	99·6	24·2	44·3	41·3	5·2	11·9	0·053	4·5	o: sN
18	..	29·484	51·7	31·3	20·4	39·0	− 2·4	36·3	32·7	6·3	16·8	1·5	79	103·4	26·5	44·8	41·8	6·3	12·0	0·013	6·5	o
19	..	29·391	48·1	28·2	19·9	37·1	− 4·3	35·8	34·0	3·1	7·3	0·0	89	101·3	20·8	44·3	41·9	5·4	12·0	0·000	1·0	o
20	..	29·177	40·5	32·4	8·1	35·2	− 6·3	33·0	29·5	5·7	11·3	1·4	79	52·7	29·8	44·5	42·3	0·0	12·1	0·030	6·0	o
21	..	29·183	41·3	30·6	10·7	36·1	− 5·5	34·3	31·6	4·5	7·1	1·1	84	58·2	23·0	43·8	41·8	0·0	12·2	0·079	0·0	o
22	Greatest Dec. N. First Quarter	29·532	47·4	26·7	20·7	35·0	− 6·7	32·9	29·5	5·5	15·5	0·0	80	76·3	18·5	43·3	41·3	2·6	12·2	0·148	0·0	o: sN, s
23	..	29·498	49·0	26·5	22·5	37·8	− 4·0	35·4	32·1	5·7	14·7	0·0	80	94·1	22·4	43·5	41·5	6·5	12·3	0·036	3·0	o
24	..	29·040	53·0	34·9	18·1	42·3	+ 0·5	39·7	36·3	6·2	16·8	0·9	79	101·7	34·4	42·5	40·8	5·9	12·4	0·247	8·5	o
25	..	28·814	55·7	40·5	15·2	46·9	+ 4·6	43·9	40·5	6·4	14·0	1·3	80	105·5	36·0	43·3	41·3	5·9	12·4	0·151	9·0	o
26	Perigee	28·983	47·5	38·5	9·0	43·9	+ 1·3	42·8	41·5	2·4	5·3	0·0	91	67·8	34·8	44·5	42·3	0·6	12·5	0·119	4·5	o
27	..	29·138	57·2	40·7	16·5	45·0	+ 2·0	43·0	40·7	4·3	13·0	0·2	85	96·8	37·4	46·1	42·8	3·8	12·6	0·152	12·8	o
28	In Equator	29·557	56·3	39·2	17·1	47·1	+ 3·7	44·4	41·4	5·7	11·2	0·9	81	103·3	33·0	46·3	43·3	4·6	12·6	0·050	5·2	o
29	Full	29·683	59·4	42·2	17·2	48·4	+ 4·6	46·7	44·9	3·5	11·8	0·2	87	100·0	39·0	46·5	44·3	3·4	12·7	0·439	3·0	o: w
30	..	29·848	55·0	41·5	13·5	47·6	+ 3·3	45·3	42·8	4·8	10·8	1·1	85	77·6	37·0	48·1	45·3	1·1	12·8	0·000	1·5	o
31	..	29·910	54·5	38·5	16·0	46·7	+ 1·9	44·2	41·4	5·3	12·6	0·0	82	88·3	34·4	48·3	45·8	5·4	12·8	0·000	0·0	o
Means	..	29·582	48·5	34·5	14·0	41·0	− 0·6	38·6	35·5	5·5	11·7	1·3	81·2	80·4	30·0	43·5	41·2	3·2	11·8	Sum 2·230	3·7	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on March 19 and 28 for the Barometer, on March 12 and 31 for Air Temperature, and on March 12 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self registering thermometers.

The mean reading of the *Barometer* for the month was 29in·582 being 0in·140 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 59°·4 on March 29; the lowest in the month was 23°·5 on March 1; and the range was 35°·9.
The mean of all the highest daily readings in the month was 48°·5, being 1°·4 *lower* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 34°·5, being 0°·7 *lower* than the average for the 36 years, 1841–1876.
The mean daily range was 14°·0, being 0°·6 *less* than the average for the 36 years, 1841–1876.
The mean for the month was 41°·0, being 0°·6 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS. OSLER'S. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	ROBINSON'S. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles		
Mar. 1	NW : WSW	WSW : SSW	0·1	0·0	0·0	186	v, h.-fr, h	5, th.-cl, h : ci, ci.-s, s : 10, th.-r
2	S : SSW	SW : WSW	0·7	0·0	0·1	262	10, th.-r	10, oc.-th.-r
3	WSW	WSW : SW	0·7	0·0	0·0	238	10, m.-r	10, th.-r
4	SSW : Calm	NE : N : NNW	1·3	0·0	0·1	180	10, r, sl.-f : f, gt.-glm	10, r, f
5	NNW	N : NW	1·2	0·0	0·3	257	v : cu.-s	10 : 9, cu.-s, ci.-cu
6	N	N : NNW : SW	1·0	0·0	0·1	239	10, th.-r	10, th.-r : 0, h.-fr
7	WSW : NNW	NW : N : NNE	16·5	0·0	1·3	472	v, sq : 9, sl.-sn, w	10, sn : v : 10, r, st.-w
8	N	N	8·8	0·0	1·2	448	v, w : v, sl.-sn	vv, sn : 0, h.-fr
9	NNW : N	NE : ENE : SSE	2·3	0·0	0·2	216	0, h.-fr : 2, ci.-s	10 : 10
10	SSE	SSE : SE	0·5	0·0	0·0	180	v : ci.-cu, cu.-s, ci.-s	6, ci, ci.-cu, ci.-s, cu : 0
11	SE	SE : S : SW	0·3	0·0	0·0	154	0, h.-fr	0 : 1, li.-cl, d
12	SW : WSW	WSW : W	12·5	0·0	1·6	511	v	10, w : 10, sl.-r
13	W : WNW	WNW : NW : W	6·6	0·0	1·1	473	10, w : 10, oc.-th.-r, w	10, th.-r : 10, r
14	W	W : WSW	4·0	0·0	1·0	458	v	10 : v, th.-r : v
15	WSW : W	W : SW	5·3	0·0	1·0	417	v : cu.-s, cu, ci.-cu	9, ci.-cu, cu.-s : v : 0
16	SW : W	W : WSW : SW	9·2	0·0	1·6	513	v : 6, cu.-s, cu, ci	v, ci, ci.-cu, cu.-s, w : 0
17	WSW	W : NW : WSW	5·3	0·0	0·6	371	0 : ci	v, ci.-cu, cu.-s, r, sn : v, r, sn, hl : 0
18	WSW	SSW : SW	2·6	0·0	0·2	267	0	v, ci, cu, ci.-cu, cu.-s : v, r : 1, th.-cl, h.-fr
19	SW : W : NE	NNE : ENE : NE	1·1	0·0	0·1	198	0, th.-f	7, cu.-s, ci.-cu, li.-cl : 10 : 4, ci.-cu, cu.-s
20	NNE	NNE : N	8·5	0·0	1·9	548	v : 10	10 th.-r, sn, w
21	N	N	8·4	0·0	1·6	383	10, th.-r, sn, w : 10, oc.-sn	10, oc.-th.-r : v : 0, lu.-ha
22	W : WSW	Variable	1·7	0·0	0·1	134	0 : 0, h	v, gt.-glm, sl : 10, r, sn : 0
23	WSW : SW : S	S : SE : ESE	1·5	0·0	0·2	215	0	7, ci, ci.-cu, cu.-s, so.-ha : 10 : 10, th.-cl, lu.-ha, r
24	Variable	SW : SSE	4·8	0·0	0·8	345	10, h.-r : 10	7, cu.-s, cu, ci : 10, r : 10, r
25	SSE : S : SSW	SE : ESE	4·6	0·0	0·5	307	10, r : 9, cu.-s, ci.-cu	v, cu.-s, ci.-cu, ci : 6, cu.-s, ci.-cu, shs.-r
26	ENE : E	ENE : ESE : SE	0·0	0·0	0·0	126	10, r	10, oc.-r : 10, fr.-r
27	WSW	SSW : WSW : SW	2·7	0·0	0·2	272	v : v, ci, cu, ci.-cu	10, th.-r : 10, r : 3, ci.-cu, ci
28	SW	SSW : S	3·2	0·0	0·4	314	10, r : 5, cu.-s, ci.-cu, ci	8, cu.-s, cu, ci.-cu, ci, ci.-s : v, cu.-s, ci.-cu, ci : v, lu.-ha
29	SSE : ENE	WSW : NW : SW	3·7	0·0	0·3	209	10, r : 10, r	v, ci, cu, ci.-cu, cu.-s, ci.-s, so.-ha : v, ci.-cu, r : 4, ci.-cu
30	WSW : W	Variable	0·8	0·0	0·1	250	v : 10	10 : 10 : 0
31	WSW	W : WSW	7·0	0·0	0·6	369	0 : 1, ci	10 : 10
Means	...	...	..	..	0·6	307		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 38°·6, being 0°·4 *lower* than
The mean *Temperature of the Dew Point* for the month was 35°·5, being 0°·5 *lower* than
The mean *Degree of Humidity* for the month was 81·2, being 0·3 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·208, being 0in·004 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2gr·4, being 0gr·1 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 547 grains, being 3 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·2.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·27. The maximum daily amount of *Sunshine* was 9·6 hours on March 11.

The highest reading of the *Solar Radiation Thermometer* was 105°·5 on March 25; and the lowest reading of the *Terrestrial Radiation Thermometer* was 18°·2 on March 1.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 2·1; for the six hours ending 3 p.m., 0·9; and for the six hours ending 9 p.m., 0·7.

The *Proportions of Wind* referred to the cardinal points were N. 7, E. 4, S. 8, and W. 12.

The *Greatest Pressure of the Wind* in the month was 16lbs·5 on the square foot on March 7. The mean daily *Horizontal Movement of the Air* for the month was 307 miles; the greatest daily value was 548 miles on March 20; and the least daily value 126 miles on March 26.

Rain fell on 17 days in the month, amounting to 2in·230, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·747 *greater* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	Phase of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Of the Water of the Thames off Greenwich. Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°		°	hours.	hours.	in.		
April 1	..	29·834	53·4	45·0	8·4	48·2	+ 2·9	47·1	45·9	2·3	5·6	0·0	92	63·6	43·8	49·3	46·3	0·0	12·9	0·230	0·3	0
2	..	29·749	58·0	41·7	16·3	49·1	+ 3·4	46·0	42·7	6·4	12·4	0·0	78	97·5	39·2	49·3	46·8	3·1	13·0	0·055	2·8	0
3	..	29·280	57·2	43·6	13·6	51·1	+ 5·0	48·3	45·4	5·7	10·3	1·3	81	81·0	40·8	49·8	47·5	0·5	13·0	0·028	19·5	0
4	Greatest Declination S	28·965	66·0	42·5	23·5	53·0	+ 6·6	49·6	46·1	6·9	14·0	3·2	78	103·4	39·5	50·5	48·3	3·4	13·1	0·410	20·5	0 : N, e
5	Last Qr.	29·165	54·0	40·7	13·3	46·5	− 0·1	43·9	40·9	5·6	12·4	2·5	82	101·2	37·8	51·8	49·3	5·5	13·2	0·166	22·3	0
6	..	29·315	56·2	40·1	16·1	45·8	− 0·9	43·3	40·5	5·3	12·0	2·0	82	99·3	36·2	51·8	49·7	3·8	13·2	0·073	16·7	0
7	Apogee	29·465	57·4	38·2	19·2	46·7	− 0·1	44·0	41·0	5·7	12·2	2·1	82	114·8	34·8	51·8	49·3	4·1	13·3	0·027	18·3	0 : sP :
8	..	29·481	56·5	45·8	10·7	48·0	+ 1·2	46·3	44·3	3·7	10·8	0·6	87	84·3	39·5	51·5	49·3	1·4	13·4	0·950	15·0	0
9	..	29·367	57·7	46·0	11·7	50·8	+ 3·9	48·7	46·5	4·3	9·1	0·4	86	84·6	43·8	51·5	49·5	0·0	13·4	0·183	9·0	0
10	..	29·364	58·8	43·6	15·2	50·7	+ 3·8	48·7	46·6	4·1	10·6	0·0	87	80·7	38·6	52·1	49·1	0·2	13·5	0·298	3·3	0
11	In Equator	29·530	56·4	41·1	15·3	47·6	+ 0·6	45·8	43·8	3·8	6·4	0·8	88	70·5	39·0	52·1	50·1	0·6	13·6	0·153	6·7	0 : s
12	..	29·860	50·3	35·7	14·6	42·7	− 4·4	39·4	35·5	7·2	14·3	2·4	76	113·7	33·5	52·3	49·7	5·8	13·6	0·000	9·7	..
13	New	29·822	57·5	37·7	19·8	46·7	− 0·5	43·9	40·7	6·0	14·0	0·7	81	93·5	35·4	52·3	49·8	1·1	13·7	0·145	12·5	.:
14	..	29·946	54·4	41·2	13·2	46·2	− 1·2	44·7	43·0	3·2	8·4	0·0	89	91·2	39·0	52·5	50·3	0·3	13·7	0·000	10·8	..
15	..	29·891	53·5	38·7	14·8	46·0	− 1·5	41·8	37·0	9·0	15·0	1·5	72	88·3	36·7	52·5	50·3	1·0	13·8	0·000	14·5	..
16	..	29·560	46·9	38·7	8·2	43·8	− 3·8	38·0	31·1	12·7	16·5	9·0	60	77·0	34·2	52·3	50·1	0·4	13·9	0·000	22·7	..
17	..	29·446	46·3	35·2	11·1	40·7	− 7·1	36·1	30·3	10·4	14·3	5·8	66	83·0	34·1	52·3	50·1	3·0	13·9	0·057	17·8	..
18	Greatest Declination N	29·436	42·0	36·2	5·8	39·4	− 8·5	36·8	33·4	6·0	9·2	3·0	80	49·6	36·0	49·8	47·3	0·0	14·0	0·048	4·2	..
19	..	29·741	51·4	36·0	15·4	43·4	− 4·6	39·8	35·5	7·9	15·5	3·2	74	109·8	32·0	48·5	46·3	4·6	14·1	0·025	4·5	..
20	First Qr.	30·042	59·3	32·1	27·2	44·6	− 3·5	41·1	37·1	7·5	15·0	0·3	74	116·3	28·1	47·3	45·3	5·1	14·1	0·000	4·5	0
21	..	29·799	49·0	42·0	7·0	46·3	− 1·9	45·1	43·8	2·5	4·8	0·0	92	54·8	40·0	47·5	45·3	0·0	14·2	0·223	9·5	0
22	Perigee	29·463	61·9	45·5	16·4	51·7	+ 3·5	48·6	45·5	6·2	14·1	0·0	79	110·0	40·8	47·5	45·5	4·3	14·2	0·025	9·5	0 : sI
23	..	29·412	58·5	37·2	21·3	45·2	− 3·1	41·5	37·2	8·0	19·2	2·5	74	113·0	34·0	48·3	46·1	7·8	14·3	0·037	8·5	0
24	In Equator	29·524	57·5	34·1	23·4	45·5	− 2·8	41·8	37·5	8·0	18·0	0·5	74	115·3	29·7	49·1	46·3	6·5	14·4	0·020	2·3	0
25	..	29·735	53·1	33·6	19·5	43·1	− 5·3	40·2	36·7	6·4	13·6	0·3	78	104·5	27·1	49·5	47·3	5·7	14·4	0·000	1·5	0
26	..	29·784	49·7	35·3	14·4	42·3	− 6·1	39·6	36·3	6·0	11·3	2·2	80	71·5	34·5	50·8	48·3	0·3	14·5	0·000	7·3	0 : w
27	Full	29·680	51·0	35·9	15·1	44·4	− 4·0	41·1	37·3	7·1	12·4	2·4	75	94·3	34·0	51·1	48·3	2·0	14·5	0·000	13·7	0
28	..	29·579	48·9	41·6	7·3	44·7	− 3·8	41·6	38·0	6·7	9·9	4·0	77	56·0	41·0	50·1	48·1	0·0	14·6	0·000	4·2	0
29	..	29·670	51·4	39·3	12·1	44·5	− 4·0	42·3	39·7	4·8	10·5	1·5	83	65·4	39·0	50·1	48·1	0·0	14·7	0·196	0·0	0
30	..	29·934	53·7	41·2	12·5	44·7	− 3·9	41·5	37·8	6·9	12·6	2·4	76	106·4	37·5	50·1	48·1	1·3	14·7	0·000	0·0	0
Means	..	29·595	54·3	39·5	14·7	46·1	− 1·3	43·2	39·9	6·2	12·1	1·8	79·4	89·8	36·7	50·5	48·2	2·4	13·8	Sum 3·349	9·7	..
Number of Column for Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9^h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on April 9, 18, and 28 for Air Temperature, and on April 18 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The Electrical Apparatus was not in action from April 12 to 19.

The mean reading of the *Barometer* for the month was $29^{in}\cdot595$, being $0^{in}\cdot208$ *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was $66^\circ\cdot0$ on April 4; the lowest in the month was $32^\circ\cdot1$ on April 20; and the range was $33^\circ\cdot9$.

The mean of all the highest daily readings in the month was $54^\circ\cdot3$, being $3^\circ\cdot6$ *lower* than the average for the 36 years, 1841–1876.

The mean of all the lowest daily readings in the month was $39^\circ\cdot5$, being $0^\circ\cdot3$ *higher* than the average for the 36 years, 1841–1876.

The mean daily range was $14^\circ\cdot7$, being $4^\circ\cdot0$ *less* than the average for the 36 years, 1841–1876.

The mean for the month was $46^\circ\cdot1$, being $1^\circ\cdot3$ *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY. 1877.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS.						CLOUDS AND WEATHER.	
	OSLER'S.					ROBINSON'S.		
	General Direction.		Pressure on the Square Foot.					
	A.M.	P.M.	Greatest.	Least.	Mean of 24 Hourly Measures.	Horizontal Movement of the Air.	A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
April 1	WSW : W : NW	NW : W : NNW	1·7	0·0	0·1	278	10 : 10, th.-r	10, fr.-shs : 10, r
2	NNW	WSW : SW : SSW	1·7	0·0	0·1	260	10, r : 10, cu.-s, ci.-s	9,cu.-s,ci.-cu : 10 : 10
3	S : SE	SSE : SSW	5·2	0·0	0·4	318	v : 8, ci, ci.-cu	10, oc.-r : 10, oc.-th.-r : 6
4	S : SSW	SSE : SSW : SW	5·7	0·0	1·0	416	v : 10	10,t.-s,h.-r,hl : 10, r : 8, ci.-cu
5	SSW	SSW : S	7·0	0·0	0·6	375	v : v, fr.-shs	v, ci, ci.-cu, cu.-s, : v, shs.-r
6	SSE : S : SSW	S : SW	2·7	0·0	0·4	317	v, r : 8, cu.-s, ci.-cu	10, shs.-r : 10, r
7	SW	SSW : S	2·2	0·0	0·3	327	v : cu.-s, ci, ci.-cu, so.-ha, sl.-r	8,th.-cl,ci,ci.-cu,sh.-r : v : v,ci.-cu,cu.-s
8	S	SE : E : ENE	2·9	0·0	0·2	268	10 : 10, cu.-s, cu	10, r : 10, h.-r
9	ENE : SE : SW	SW : ENE	2·5	0·0	0·1	153	10, r : 10	10, so.-ha : 10, r
10	NW	NW : SW	0·0	0·0	0·0	173	10, r : 10, r	v,ci.-s,ci.-cu : v,ci.-cu,sh.-r : 0
11	WSW : SSE	SSE : NE	1·0	0·0	0·1	199	0 : 8, cu.-s, cu, ci, r	v, fr.-shs, t.-s : 10
12	NE : E	ESE	1·2	0·0	0·1	234	v : 4, cu.-s, cu	9,ci.cu,ci.-s,cu.-s : th.-cl : v
13	ESE : SW	SW : NW	0·4	0·0	0·0	110	v, cu.-s, cu	10, shs.-r : 10, th.-r
14	WSW : NE : ENE	ESE	3·4	0·0	0·2	214	10 : 10	v, cu, ci : 10 : 4,cu.-s,ci.-cu
15	ESE : SE	ESE	2·6	0·0	0·5	330	v : 8, ci.-cu, ci.-s	9,ci.-cu,ci.-s,th.-cl : 10, th.-cl
16	ESE	E	34·0	0·1	4·6	621	10,th.-cl,so.-ha,st.-w	8, th.-cl, so.-ha, g : v, g
17	E : ENE	ENE : NE	29·3	0·0	4·8	711	v, g : 8, cu.-s, cu, ci.-cu, ci, g	10, r, sn, g : 10, r
18	NE	NE : NNE	3·7	0·0	0·6	497	10 : 10, th.-r	10 : 10, r
19	NNE : NE	NE : NNE	13·0	0·0	0·5	467	10, sl.-r : 10, sq	v, cu.-s, cu : v : 0
20	NNE : N	E : SE : S	0·5	0·0	0·0	146	0 : 1, cu, h	7,cu.-s,cu,ci : 10, cu : lu.-ha
21	SE : SSE	S : SW	2·6	0·0	0·3	232	10 : 10, r	10, r : 10
22	WSW	WSW : W	4·0	0·0	0·1	269	10 : 10, cu, ci.-cu, sh.-r	v, oc.-shs, t : 10, fr.-shs
23	WSW	WSW : SW : S	3·3	0·0	0·2	283	10 : 5, cu.-s, cu, ci	9, cu.-s,ci.-cu,ci,cu,r,t.-s : 3, ci, ci.-cu
24	Variable	NE : ESE	0·8	0·0	0·0	154	v : 4, ci.-cu, h	v,ci,ci.-cu,cu.-s : v, hl, fr.-shs : 1, ci.-cu
25	E : ENE	E : ENE	1·3	0·0	0·1	218	v : 2, cu.-s, cu	10 : v : 4, cu, ci
26	ENE	E : ENE	1·5	0·0	0·2	278	v : 10, th.-r	10 : v : 0
27	ENE : E	ENE	11·0	0·0	1·5	480	v : 10	10, w : 10
28	ENE : NE	NE	1·5	0·0	0·1	349	10 : 10	10 : 10
29	NNE	ENE : ESE : NNE	0·2	0·0	0·0	223	10 : 10	10, r : 3
30	NNE	N : NNE	0·8	0·0	0·1	332	v : 10	9, cu.-s, ci.-cu : 10
Means	...	...	..	..	0·6	308		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 43°·2, being 0°·7 *lower* than
The mean *Temperature of the Dew Point* for the month was 39°·9, being 0°·4 *lower* than
The mean *Degree of Humidity* for the month was 79·4, being 2·5 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·246, being 0in·004 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2grs·8, being 0gr·1 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 542 grains, being 2 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 8·4.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·17. The maximum daily amount of *Sunshine* was 7·8 hours on April 23.

The highest reading of the *Solar Radiation Thermometer* was 116°·3 on April 20; and the lowest reading of the *Terrestrial Radiation Thermometer* was 27°·1 on April 25.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 4·5; for the six hours ending 3 p.m., 3·4; and for the six hours ending 9 p.m., 1·8.

The *Proportions of Wind* referred to the cardinal points were N. 6, E. 10, S. 9, and W. 5.

The *Greatest Pressure of the Wind* in the month was 34lbs·0 on the square foot on April 16. The mean daily *Horizontal Movement of the Air* for the month was 308 miles; the greatest daily value was 711 miles on April 17; and the least daily value 110 miles on April 13.

Rain fell on 20 days in the month, amounting to 3in·549, as measured in the simple cylinder gauge partly sunk below the ground; being 1in·834 *greater* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Lowest.	Daily Duration of Sun Light.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°	h.	h.	in.		
May 1	Greatest Declination S	30·185	48·0	36·6	11·4	41·9	− 6·8	37·4	31·9	10·0	14·5	5·3	68	85·5	33·9	49·3	47·7	0·2	14·8	0·000	0·0	0
2	..	30·116	51·3	35·5	15·8	43·0	− 5·9	37·4	30·7	12·3	18·3	7·1	61	101·3	31·5	49·1	46·8	1·2	14·8	0·000	3·0	0
3	..	29·951	52·9	31·9	21·0	40·4	− 8·7	37·3	33·3	7·1	12·6	4·3	76	95·7	27·1	49·3	47·3	4·3	14·9	0·000	1·0	0
4	..	29·865	50·1	28·1	22·0	38·6	−10·8	34·4	28·8	9·8	18·1	4·3	68	107·0	26·8	48·7	47·1	5·2	14·9	0·000	8·2	W
5	Apogee Last Quarter	29·714	52·3	33·2	19·1	40·2	− 9·5	35·7	29·9	10·3	18·3	2·5	66	115·6	23·0	48·8	46·8	9·0	15·0	0·000	6·7	W : 0
6	..	29·664	52·0	30·8	21·2	42·3	− 7·7	37·7	32·1	10·2	17·4	4·3	68	125·3	27·1	48·3	46·3	12·5	15·1	0·000	8·0	0 : W : 0
7	..	29·622	62·6	31·5	31·1	47·9	− 2·4	41·7	34·8	13·1	24·5	2·3	61	119·8	26·0	49·3	46·7	12·1	15·1	0·000	11·0	0 : W : 0
8	In Equator	29·536	66·2	32·6	33·6	51·1	+ 0·5	44·0	36·6	14·5	25·2	3·4	58	123·0	25·7	49·8	47·9	13·0	15·2	0·000	11·8	0
9	..	29·357	66·6	44·3	22·3	54·7	+ 3·9	48·9	43·3	11·4	22·1	1·9	66	129·1	39·2	51·3	48·9	7·4	15·2	0·000	13·5	0
10	..	29·378	65·9	46·5	19·4	53·5	+ 2·4	47·9	42·3	11·2	21·5	2·1	66	124·6	43·4	52·9	50·1	6·3	15·3	0·002	19·7	0
11	..	29·355	59·7	45·9	13·8	50·2	− 1·2	47·7	45·0	5·2	14·1	0·6	83	113·0	45·0	53·3	50·8	1·3	15·3	0·088	0·0	W : 0
12	..	29·394	58·2	40·3	17·9	49·4	− 2·4	47·8	46·1	3·3	9·3	0·0	89	101·1	37·8	54·3	51·7	0·1	15·4	0·153	3·0	-N.-P. 0
13	New	29·495	60·4	47·6	12·8	51·5	− 0·6	49·5	47·5	4·0	9·1	0·2	86	92·0	44·6	55·3	51·8	0·5	15·4	0·018	0·3	0
14	..	29·483	57·8	42·5	15·3	50·3	− 2·2	48·1	45·8	4·5	10·3	0·2	85	76·2	38·0	55·3	52·1	0·0	15·5	0·002	1·2	W : 0
15	Greatest Declination N	29·686	64·7	45·8	18·9	53·5	+ 0·6	49·8	46·1	7·4	20·9	0·0	76	117·9	41·5	55·3	52·5	4·5	15·5	0·067	3·0	0
16	..	29·914	62·0	41·6	20·4	51·7	− 1·6	49·0	46·3	5·4	11·2	2·2	82	106·1	36·5	55·7	52·7	4·7	15·6	0·168	11·8	-N.-P. 0
17	Perigee	29·660	56·5	48·5	8·0	52·5	− 1·2	50·7	48·9	3·6	7·2	1·8	88	71·0	45·5	56·3	53·3	0·0	15·6	0·249	19·5	-N.-P.: 0
18	..	29·772	64·9	44·9	20·0	53·8	− 0·3	49·0	44·3	9·5	20·5	0·8	70	119·5	42·1	56·7	53·7	9·7	15·7	0·000	6·0	0
19	..	29·676	58·2	46·4	11·8	49·9	− 4·5	48·0	46·0	3·9	5·8	0·4	87	76·8	42·8	56·7	53·9	0·3	15·7	0·293	7·0	0 -N.-P. 0
20	First Qr.	29·888	53·2	45·5	7·7	49·0	− 5·7	46·9	44·6	4·4	9·6	1·5	85	85·1	43·1	56·3	53·9	0·1	15·8	0·085	5·2	0
21	In Equator	30·006	57·3	44·1	13·2	48·8	− 6·2	46·1	43·2	5·6	11·6	2·1	81	93·8	41·7	56·3	53·3	0·8	15·8	0·000	5·3	0
22	..	30·032	52·3	43·9	8·4	46·5	− 8·8	44·3	41·8	4·7	8·4	0·9	85	68·3	43·7	55·8	52·8	0·0	15·9	0·140	5·7	0
23	..	30·037	51·9	40·9	11·0	45·6	− 9·9	41·9	37·6	8·0	13·2	3·5	74	71·0	40·9	55·3	52·5	0·2	15·9	0·000	8·5	0
24	..	30·030	56·4	42·0	14·4	47·6	− 8·1	43·8	39·6	8·0	12·8	2·9	75	115·5	41·3	54·3	51·8	2·2	16·0	0·002	3·7	0
25	..	30·062	63·9	47·9	16·0	50·8	− 5·1	46·7	42·4	8·4	17·9	0·7	74	121·9	34·1	54·1	51·3	5·5	16·0	0·000	5·0	0
26	..	29·982	67·6	47·2	20·4	54·9	− 1·2	50·3	45·9	9·0	20·5	2·7	71	121·6	44·9	54·3	51·8	4·7	16·0	0·000	1·3	0
27	Full	29·641	65·5	43·0	22·5	54·6	− 1·7	49·3	44·2	10·4	18·4	3·2	68	123·8	37·7	54·7	52·3	11·0	16·1	0·000	11·8	0
28	Greatest Declination S	29·130	63·0	50·7	12·3	55·3	− 1·2	51·1	47·1	8·2	13·5	1·4	74	117·7	46·9	55·3	52·8	7·0	16·1	0·109	16·7	0
29	..	29·372	63·8	44·5	19·3	52·5	− 4·3	47·4	42·2	10·3	21·5	2·9	69	121·2	41·0	56·3	54·1	9·6	16·1	0·000	13·5	0
30	..	29·451	65·8	43·6	22·2	53·3	− 3·7	48·3	43·3	10·0	20·5	1·5	69	126·1	38·2	56·8	54·3	12·4	16·2	0·000	17·7	0
31	..	29·453	66·4	44·0	22·4	55·2	− 2·1	51·5	48·0	7·2	14·1	1·9	77	109·6	40·0	57·3	54·5	1·5	16·2	0·000	14·1	0
Means	..	29·707	59·3	41·7	17·6	49·4	− 3·8	45·5	41·3	8·1	15·6	2·2	74·4	105·7	37·7	53·6	51·1	4·7	15·6	Sum 1·376	7·8	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on May 4, 5, 9, and 20 for Air Temperature, and on May 2, 4, 5, 14, and 20 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·707, being 0in·070 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 67°·6 on May 26; the lowest in the month was 28°·1 on May 4; and the range was 39°·5.
The mean of all the highest daily readings in the month was 59°·3, being 5°·1 *lower* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 41°·7, being 2°·1 *lower* than the average for the 36 years, 1841–1876.
The mean daily range was 17°·6, being 3°·0 *less* than the average for the 36 years, 1841–1876.
The mean for the month was 49°·4, being 3°·8 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
May 1	NNW : N	NNE : N	0·8	0·0	0·0	271	10 : 10	10 : 10
2	Variable	SW	0·0	0·0	0·0	118	10 : 10	10, cu : v : 0
3	WSW : NE	NE : E : ENE	2·0	0·0	0·1	234	0 : 0, h	10, oc.-th.-r : 10, th.-r : 3
4	ENE	E	2·1	0·0	0·2	282	v : 7, cu.-s, cu, ci, ci.-cu	v,ci,cu,cu.-s,ci.-cu: 4, cu, ci : 0
5	NE	ENE : E	0·7	0·0	0·0	214	0 : v	8, ci.-cu, cu.-s, ci : v, cu.-s
6	ENE : E	ESE : ENE	3·8	0·0	0·4	288	v : 5, ci.-cu	3, ci.-cu : 0
7	NE : ENE	ESE : E : ENE	0·7	0·0	0·0	172	0 : 1, ci.-s	1, ci, ci.-s : 0
8	NNE : NE	E : ESE	0·8	0·0	0·0	174	0 : 1, ci	2, cu, ci : v : 7, ci, ci.-cu
9	ESE : SSW	S : SSE	1·8	0·0	0·0	197	v : 10, cu.-s, cu, ci	6, ci.-cu : v : 9
10	SW : WSW	SSW : SE	1·9	0·0	0·1	209	v : 9, ci.-cu, cu.-s. ci	8,ci,cu,ci.-cu,cu.-s,cu.-s,so.-ha: v
11	NNE : N	Variable	0·0	0·0	0·0	100	10 : 10, th.-r	v, r, glm : v
12	SSE : NE	SE	0·0	0·0	0·0	82	v : 10, shs.-r, t	10, r, t : 10, oc.-r
13	N	Variable	0·0	0·0	0·0	142	10 : 10, th.-r	10, r : v,cu,cu.-s,ci.-cu: v
14	SE : ENE	E : ESE	0·0	0·0	0·0	121	v : 10, th.-r	10, oc.-th.-r : 10
15	ESE : W	WNW : W : WSW	6·3	0·0	0·4	270	10, shs.-r : 10, th.-r	6,ci,cu,ci.-cu,cu.-s: v : 2, ci.-cu, s
16	SW : WSW	SW : SSW	4·0	0·0	0·1	270	10 : 3, cu, ci.-cu, ci, cu.-s, oc.-r	v, cu, ci, ci.-cu, cu.-s, oc.-r: v
17	SSW : S	SW : W	8·2	0·0	0·7	385	v : 10, r	10, r, w : 10, th.-r : 2, ci.-cu, cu
18	WSW : W	WSW	8·5	0·0	1·2	493	0 : 7, ci.-cu, cu.-s	6, cu.-s, cu, ci.-cu, w: vv, l
19	WSW	W : NW : N	3·2	0·0	0·3	340	v : 10, r	10, fr.-shs : 10, oc.-r
20	N . NNE	N	7·5	0·0	1·2	428	10 : 10, r	10 : 10
21	N	NNE	8·0	0·0	1·5	454	10 : 10	10, w : 9,ci.-cu,cu.-s,w: 10, r
22	NNE	NNE	5·3	0·0	0·8	413	10, r : 10, th.-r	10 : 10
23	NNE	NNE	1·0	0·0	0·1	335	10 : 10	10 : 10
24	N : NNE	NNE : NE	1·3	0·0	0·1	244	10 : 10. oc.-th.-r	10 : 10, oc.-r : 10
25	NNE : NE	NE : SSW	0·0	0·0	0·0	132	v : 0, h	v, li.-cl : 10, li.-cl : v
26	Calm : SW	SSW	0·3	0·0	0·0	189	v : 1, ci.-s	8,ci.-cu,cu,cu.-s,h: v,cu.-s,ci,ci.-cu: 0
27	SSW : SW	SW : SSW	7·4	0·0	0·9	442	v : 8, ci.-cu, ci.-s, w	3, ci, ci.-cu, w : 2, ci.-cu
28	SSW : SW	SW	24·8	0·0	2·2	670	v, h.-r : cu.-s, cu, ci.-cu, w	10, r, g : 8, cu.-s
29	SW	SW	4·0	0·0	0·4	398	v : 5,ci, ci.-cu, cu, cu.-s, oc.-r	v, cu.-s, cu, ci.-cu : v
30	SW	SW : SSW : S	2·5	0·0	0·2	345	v : 8, cu.-s, cu, ci	6, ci, ci.-cu, cu.-s : 0
31	NE : ESE	SW : SSE	2·0	0·0	0·1	245	v : 10, th.-r	10, th.-cl, r, so.-ha : 10. li.-cl
Means	...	...	..	..	0·4	279		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 45°·5, being 3°·4 *lower* than the average for the 20 years, 1849–1868.
The mean *Temperature of the Dew Point* for the month was 41°·3, being 3°·8 *lower* than the average for the 20 years, 1849–1868.
The mean *Degree of Humidity* for the month was 74·4, being 1·0 *less* than the average for the 20 years, 1849–1868.
The mean *Elastic Force of Vapour* for the month was 0in·260, being 0in·041 *less* than the average for the 20 years, 1849–1868.
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 3grs·0, being 0gr·4 *less* than the average for the 20 years, 1849–1868.
The mean *Weight of a Cubic Foot of Air* for the month was 540 grains, being 2 grains *greater* than the average for the 20 years, 1849–1868.
The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·1.
The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·30. The maximum daily amount of *Sunshine* was 13·0 hours on May 8.
The highest reading of the *Solar Radiation Thermometer* was 129°·1 on May 9; and the lowest reading of the *Terrestrial Radiation Thermometer* was 23°·0 on May 5.
The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·4; for the six hours ending 3 p.m., 2·7; and for the six hours ending 9 p.m., 1·7.
The *Proportions of Wind* referred to the cardinal points were N. 9, E. 8, S. 7, and W. 6. One day was calm.
The *Greatest Pressure of the Wind* in the month was 24lbs·8 on the square foot on May 28. The mean daily *Horizontal Movement of the Air* for the month was 279 miles; the greatest daily value was 670 miles on May 28; and the least daily value 82 miles on May 12.
Rain fell on 10 days in the month, amounting to 1in·376, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·613 *less* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Of the Water of the Thames off Greenwich. Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours.	hours.	in.		
June 1	..	29·394	60·0	50·8	9·2	54·7	− 2·8	51·5	48·4	6·3	9·9	4·0	79	92·6	46·5	58·3	55·3	2·5	16·2	0·166	24·4	sP, sN : 0
2	Apogee	29·697	60·8	50·6	10·2	54·5	− 3·2	51·7	48·9	5·6	8·2	3·2	81	85·0	46·7	57·9	55·3	0·0	16·3	0·000	19·2	0
3	..	29·616	78·9	45·2	33·7	64·9	+ 7·0	57·3	51·0	13·9	28·9	0·6	61	129·6	39·8	57·5	55·3	12·6	16·3	0·000	10·7	0
4	Last Qr.	29·563	81·7	53·1	28·6	66·6	+ 8·5	60·6	55·8	10·8	18·9	5·1	69	136·5	46·0	58·8	56·3	9·8	16·3	0·005	10·5	0 : sP, sN : 0
5	In Equator	29·781	70·5	49·5	21·0	59·3	+ 1·1	52·5	46·5	12·8	21·1	3·6	62	120·9	43·5	59·8	57·3	8·6	16·4	0·000	17·0	0
6	..	29·839	67·2	46·5	20·7	55·3	− 3·0	51·2	47·3	8·0	17·5	1·2	75	126·0	40·6	60·3	57·5	6·5	16·4	0·065	22·6	0
7	..	29·979	70·0	44·2	25·8	55·9	− 2·5	50·3	45·1	10·8	23·8	2·5	67	127·8	40·4	60·3	57·8	11·0	16·4	0·000	10·9	0
8	..	29·931	73·4	47·1	26·3	60·7	+ 2·2	54·6	49·2	11·5	20·5	2·5	66	132·3	41·3	61·3	58·8	8·1	16·4	0·000	9·7	0
9	..	29·918	78·9	55·2	23·7	66·2	+ 7·7	59·0	53·2	13·0	24·1	4·6	63	135·6	48·3	62·3	59·3	13·7	16·4	0·000	13·8	0
10	..	29·933	80·2	53·3	26·9	65·5	+ 6·9	58·6	53·0	12·5	22·8	4·6	64	134·0	48·0	63·3	60·3	13·2	16·5	0·000	11·0	0
11	New Greatest Declination N	29·889	83·7	51·5	32·2	67·1	+ 8·4	60·4	55·0	12·1	26·2	1·4	65	129·4	46·8	64·3	61·5	13·1	16·5	0·160	8·9	0
12	..	29·714	76·9	57·1	19·8	65·9	+ 7·1	62·8	60·3	5·6	11·9	1·1	83	132·5	57·1	65·8	62·5	4·6	16·5	0·250	12·6	0
13	Perigee	29·821	66·4	51·0	15·4	59·4	+ 0·5	55·9	52·8	6·6	15·2	2·5	79	113·5	46·0	66·3	63·3	3·4	16·5	0·000	16·7	0
14	..	29·931	68·8	49·1	19·7	59·2	+ 0·1	54·0	49·3	9·9	21·2	2·0	70	129·2	44·5	67·3	63·8	11·8	16·5	0·000	11·3	0
15	..	29·994	73·7	51·9	21·8	61·9	+ 2·6	56·0	51·0	10·9	21·6	2·4	68	134·7	47·1	67·3	63·8	10·9	16·5	0·000	13·0	0
16	..	29·966	76·2	48·0	28·2	63·3	+ 3·8	56·8	51·3	12·0	23·0	1·8	65	137·6	39·7	66·5	63·8	11·9	16·5	0·000	8·7	0
17	..	29·873	80·2	51·0	29·2	66·4	+ 6·7	58·5	52·1	14·3	28·0	2·2	60	140·3	42·2	66·3	64·3	13·3	16·6	0·000	3·7	0
18	In Equator First Quarter	29·882	82·7	50·5	32·2	67·6	+ 7·7	58·7	51·6	16·0	34·5	3·6	56	144·5	42·7	67·1	65·3	12·6	16·6	0·000	4·0	0
19	..	29·919	84·4	52·3	32·1	68·6	+ 8·4	60·6	54·4	14·2	28·2	3·4	60	137·9	43·4	68·3	66·3	12·1	16·6	0·000	9·8	0
20	..	29·882	77·7	53·5	24·2	64·0	+ 3·5	58·5	53·9	10·1	20·7	3·0	69	135·0	48·3	68·8	66·3	8·5	16·6	0·000	15·5	0
21	..	29·698	76·8	49·9	26·9	62·8	+ 2·0	57·8	53·6	9·2	20·2	0·0	72	133·5	44·8	69·1	66·8	7·8	16·6	0·000	12·8	0
22	..	29·440	74·4	57·1	17·3	63·6	+ 2·5	58·4	54·0	9·6	18·4	2·9	72	127·9	51·9	69·3	67·1	8·6	16·6	0·000	14·2	W
23	..	29·598	67·3	46·0	21·3	58·6	− 2·8	53·3	48·7	9·9	22·3	1·9	69	119·0	39·0	69·1	66·3	4·1	16·6	0·015	7·7	0
24	..	29·927	72·2	44·8	27·4	57·6	− 4·1	50·4	43·8	13·8	27·7	0·8	60	125·0	36·9	67·3	64·5	12·1	16·6	0·000	5·0	0
25	Greatest Dec. S. Full	29·978	74·8	44·2	30·6	59·2	− 2·7	51·5	44·7	14·5	22·3	2·9	58	131·2	36·5	66·3	64·5	8·5	16·6	0·000	3·6	0
26	..	29·928	72·2	50·2	22·0	59·9	− 2·1	55·2	51·1	8·8	14·4	3·0	73	119·0	42·9	67·1	64·3	3·8	16·5	0·000	4·9	0
27	..	29·974	73·2	54·8	18·4	61·9	− 0·1	55·9	50·8	11·1	23·6	3·4	68	116·4	47·4	66·5	64·5	4·5	16·5	0·022	0·0	0
28	..	30·069	79·6	46·2	33·4	63·1	+ 1·2	55·2	48·5	14·6	23·8	2·7	59	125·0	38·6	66·3	64·8	10·7	16·5	0·000	5·0	0
29	Apogee	30·051	85·5	55·5	30·0	69·6	+ 7·8	57·8	48·7	20·9	30·4	8·5	48	144·4	48·2	66·3	64·8	12·5	16·5	0·000	8·2	0
30	..	30·005	80·1	54·0	26·1	66·2	+ 4·5	60·2	55·3	10·9	18·4	4·4	68	121·0	43·9	66·7	63·8	6·3	16·5	0·000	1·3	0
Means	..	29·840	74·9	50·5	24·5	62·3	+ 2·6	56·2	51·0	11·3	21·6	2·9	67·0	127·2	44·3	64·7	62·2	8·9	16·5	Sum 0·683	10·6	..
Number of Column for Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on June 2, 14, and 15 for the Barometer, on June 2, 3, 4, 11, 20, and 21 for Air Temperature, and on June 2, 12, 20, and 21 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·840, being 0in·012 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 85°·5 on June 29; the lowest in the month was 44°·2 on June 7 and 25; and the range was 41°·3.
The mean of all the highest daily readings in the month was 74°·9, being 3°·8 *higher* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 50°·5, being 0°·6 *higher* than the average for the 36 years, 1841–1876.
The mean daily range was 24°·5, being 3°·3 *greater* than the average for the 36 years, 1841–1876.
The mean for the month was 62°·3, being 2°·6 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
June 1	SE : S : SW	SW	20·0	0·0	3·4	673	10, r : 10, r, g	10, r, g : 10, r, st.-w
2	SW	SW : SSW	23·0	0·0	2·4	545	v, g : 10, th.-r, st.-w	10, st.-w : 10, li.-cl
3	SE : S	SSE : S : SSW	7·0	0·0	0·6	302	v : 1, cu	1, cu : 0
4	SW : W : SE	SSE : S : SW	1·7	0·0	0·1	236	v : cu, sh.-r	5,cu,ci.-cu,cu.-s,ci: 5, cu, ci.-cu : v,cu.-s,cu,ci,l
5	SW	SW	6·2	0·0	1·1	446	v : 6, ci.-cu, cu.-s, ci	9,ci,ci.-cu,cu.-s,ci.-s: 10 : 10, li.-cl
6	SSW	SSW : WSW	6·0	0·0	1·1	403	v : 6, cu, ci.-cu, cu.-s, ci, ci.-s	8, cu, cu.-s, ci.-cu, ci : 10, r
7	WSW : SW	SW : SSW	2·7	0·0	0·3	341	0 : 2, ci, cu, cu.-s	4,ci.-cu,cu.-s,ci.-s: v,cu.-s,ci.-s,ci.-cu,cu: 8, cu.-s
8	SSW : S : SSE	S : SSW	1·7	0·0	0·1	208	v : 7, ci, ci.-cu	6, cu.-s, ci.-cu : v, ci.-cu, cu.-s
9	SW : WSW	WSW : SSW	0·2	0·0	0·0	243	v : ci	4, cu, ci.-cu, ci.-s, ci : 0
10	SW : WSW	SW	0·3	0·0	0·0	225	0 : 0, h	0 : 0
11	SW : NE : SE	SSW : E : ENE	0·5	0·0	0·0	139	0 : 1, ci, h, mt	0 : 8, cu.-s, ci.-cu, t.-s, h.-r
12	ENE : ESE	ENE : ESE	0·0	0·0	0·0	168	v, h.-r, l : 8, cu.-s, cu, ci.-cu	10, t : 10
13	NE : ENE	E	1·1	0·0	0·0	284	10 : 10	10 : 0
14	ENE : E	E	2·9	0·0	0·4	321	0 : 2, ci.-cu, ci	0 : 0
15	ENE	E : ENE	3·2	0·0	0·5	333	0 : 3, ci.-cu	0 : 0
16	NE : ENE	E : ENE	6·2	0·0	0·5	296	0 : v, th.-cl : 0	0 : 0
17	NE : ENE	ENE	6·3	0·0	0·4	283	0 : 1, ci	0 : 0
18	NE : ENE	E : ESE	1·2	0·0	0·1	191	0 : 1, ci.-s	2,ci.-s,ci,cu : v : 9, ci.-s
19	NNE : NE	NE : ESE	0·7	0·0	0·0	137	0 : 1, ci	3, ci.-cu : 4, ci.-cu
20	E : ESE	E : ENE : ESE	0·3	0·0	0·0	173	0 : 10	1, ci.-cu : 0 : 1,ci.-s,ci.-cu
21	ENE : E	ESE	1·4	0·0	0·1	211	0 : v, cu, ci.-cu	5, ci.-cu, ci.-s : 10, sh.-r
22	SW	SW	5·0	0·0	0·8	363	v : 9, cu.-s, cu, ci.-cu	7, cu.-s, cu, ci.-cu, sh.-r : v, cu.-s, ci.-cu
23	WSW : WNW	NW : N : NE	3·1	0·0	0·5	342	r : 10	v, cu.-s, cu : v, cu, ci.-cu
24	NNW	NNW	0·8	0·0	0·0	186	v : 8, cu, ci, ci.-cu	7, ci, cu, ci.-cu, cu.-s : 4, ci, cu, ci.-cu
25	WSW : W	W : WSW	0·9	0·0	0·1	219	v : 2, ci.-cu, h	7, cu.-s, cu : 7,ci.-cu,cu.-s: 3, cu.-s
26	WSW	WSW	3·6	0·0	0·7	395	v : 8, cu.-s, cu, ci.-cu, ci, th.-r	10, r : 10
27	WSW : W : N	NNW : N	0·8	0·0	0·0	227	10 : 10, r	9, th.-cl, so.-ha : 10, th.-cl
28	NNW : WSW : W	NW : WSW : SW	0·2	0·0	0·0	178	v : 2, li.-cl, h	2, li.-cl, h : 10, li.-cl
29	WSW	SW : SSW	1·2	0·0	0·2	281	1, ci.-s : 1, ci	2, ci.-s, ci : 0
30	SW : WSW	N : E	0·0	0·0	0·0	158	0 : 0, h	8, h : 8, cu.-s, ci.-cu, cu
Means	...	...	..	..	0·4	284		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 56°·2, being 1°·0 *higher* than the average for the 20 years, 1849–1868.
The mean *Temperature of the Dew Point* for the month was 51°·0, being 0°·2 *lower* than the average for the 20 years, 1849–1868.
The mean *Degree of Humidity* for the month was 67·0, being 6·3 *less* than the average for the 20 years, 1849–1868.
The mean *Elastic Force of Vapour* for the month was 0in·374, being 0in·003 *less* than the average for the 20 years, 1849–1868.
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 4grs·1, being 0gr·1 *less* than the average for the 20 years, 1849–1868.
The mean *Weight of a Cubic Foot of Air* for the month was 529 grains, being 2 grains *less* than the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 5·0.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·54. The maximum daily amount of *Sunshine* was 13·7 hours on June 9.

The highest reading of the *Solar Radiation Thermometer* was 144°·5 on June 18; and the lowest reading of the *Terrestrial Radiation Thermometer* was 36°·5 on June 25.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·8; for the six hours ending 3 p.m., 3·0; and for the six hours ending 9 p.m., 3·8.

The *Proportions of Wind* referred to the cardinal points were N. 3, E. 9, S. 9, and W. 9.

The *Greatest Pressure of the Wind* in the month was 23lbs·0 on the square foot on June 2. The mean daily *Horizontal Movement of the Air* for the month was 284 miles; the greatest daily value was 673 miles on June 1; and the least daily value 137 miles on June 19.

Rain fell on 7 days in the month, amounting to 0in·683, as measured in the simple cylinder gauge partly sunk below the ground; being 1in·268 *less* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Of the Water of the Thames off Greenwich. Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours.	hours.	in.		
July 1	..	29·858	64·6	52·0	12·6	60·1	− 1·5	57·6	55·4	4·7	12·7	1·1	84	89·5	46·0	66·8	65·3	0·5	16·5	0·255	1·5	0
2	In Equator	29·820	75·0	50·4	24·6	61·3	− 0·2	56·2	51·8	9·5	20·0	1·8	72	135·5	43·7	67·1	65·3	1·0	16·5	0·007	0·5	0
3	Last Qr.	29·830	73·4	47·7	25·7	60·0	− 1·4	55·3	51·2	8·8	19·1	0·0	72	133·8	40·7	67·1	65·8	9·9	16·4	0·010	6·8	w : 0 : sN
4	..	29·802	75·3	52·2	23·1	61·6	+ 0·2	54·8	48·9	12·7	26·6	1·6	64	138·3	47·2	66·5	64·9	8·0	16·4	0·000	6·8	0
5	..	29·762	74·7	48·7	26·0	58·6	− 2·9	52·4	46·9	11·7	23·0	0·8	65	144·8	41·0	66·8	64·8	10·9	16·4	0·182	5·0	0 : sN, sP
6	..	29·724	70·0	47·0	23·0	55·4	− 6·3	51·8	48·4	7·0	19·6	0·0	78	126·5	39·6	66·5	64·1	8·3	16·4	0·057	0·0	0 : sN, sP
7	..	29·939	68·5	44·2	24·3	55·5	− 6·4	50·6	46·0	9·5	19·3	0·6	71	127·7	36·3	66·3	63·8	7·4	16·3	0·120	0·0	sP, sN : w
8	..	30·068	64·4	42·6	21·8	54·1	− 8·1	50·9	47·8	6·3	14·8	1·0	79	115·2	35·8	65·8	62·7	4·7	16·3	0·082	0·0	0 : w : 0
9	Greatest Declination N	30·121	70·0	48·3	21·7	59·5	− 3·0	54·4	49·9	9·6	16·7	1·7	71	108·3	39·5	65·3	62·1	1·4	16·3	0·000	0·9	0
10	New	30·019	79·0	53·3	25·7	65·5	+ 2·8	58·9	53·5	12·0	23·0	3·6	65	135·0	46·4	65·8	63·3	11·0	16·3	0·000	2·9	0
11	..	29·905	76·6	52·5	24·1	63·6	+ 0·7	58·5	54·2	9·4	17·5	2·4	72	129·8	44·8	65·3	63·8	6·2	16·2	0·000	0·7	0
12	Perigee	29·781	79·0	49·5	29·5	63·8	+ 0·7	57·2	51·7	12·1	21·9	2·6	65	144·5	41·8	65·3	63·8	9·0	16·2	0·000	8·0	0
13	..	29·611	78·1	49·3	28·8	62·8	− 0·5	56·5	51·1	11·7	21·4	1·6	66	133·3	40·6	65·8	64·1	7·7	16·2	0·000	6·5	0
14	..	29·358	70·1	59·2	10·9	63·1	− 0·3	60·7	58·7	4·4	12·4	0·8	86	112·3	55·1	66·3	64·3	0·5	16·1	0·303	18·1	0
15	In Equator	29·082	69·2	55·8	13·4	60·8	− 2·6	57·8	55·2	5·6	12·6	0·6	83	109·2	52·0	66·3	64·8	5·5	16·1	0·083	14·1	0
16	..	29·186	62·8	54·0	8·8	58·5	− 5·0	56·7	55·1	3·4	11·0	0·0	88	103·1	50·4	66·3	64·5	2·1	16·1	0·710	17·2	0
17	First Qr.	29·363	64·8	54·6	10·2	58·3	− 5·2	55·8	53·6	4·7	9·5	0·0	84	99·5	51·0	65·7	63·9	0·0	16·0	0·037	5·2	0
18	..	29·690	71·1	52·5	18·6	59·4	− 4·0	54·2	49·6	9·8	19·8	2·7	70	129·0	50·1	64·9	62·9	8·1	16·0	0·000	7·2	0
19	..	29·659	71·3	55·5	15·8	62·0	− 1·3	59·2	56·8	5·2	12·4	1·1	83	113·3	55·1	64·3	62·5	0·4	16·0	0·005	1·5	0
20	..	29·748	70·1	50·5	19·6	60·2	− 3·0	53·7	48·0	12·2	20·2	3·0	64	131·0	44·0	64·5	62·7	8·6	15·9	0·000	2·7	0
21	..	29·830	74·0	48·0	26·0	60·1	− 2·9	54·7	49·9	10·2	18·4	1·9	69	133·0	41·6	64·3	61·5	13·1	15·9	0·000	7·7	0
22	Greatest Declination S	29·652	68·0	52·5	15·5	60·5	− 2·4	57·3	54·5	6·0	10·6	1·7	81	92·5	48·5	64·5	62·3	0·3	15·8	0·000	11·7	0
23	..	29·474	71·2	58·0	13·2	63·2	+ 0·4	61·0	59·1	4·1	12·2	0·9	87	116·6	53·9	65·3	63·3	1·2	15·8	0·245	12·5	0
24	..	29·437	74·0	54·8	19·2	62·7	0·0	58·3	54·6	8·1	17·6	0·4	75	124·3	48·5	64·9	63·3	5·6	15·7	0·103	9·2	0
25	Full	29·744	72·7	51·5	21·2	60·3	− 2·4	55·7	51·7	8·6	19·1	1·2	73	128·0	45·2	65·8	63·3	5·9	15·7	0·000	7·2	0
26	..	29·731	72·7	55·3	17·4	62·4	− 0·3	58·8	55·7	6·7	16·0	1·0	79	119·0	54·6	65·3	63·5	2·3	15·7	0·258	5·3	0
27	Apogee	29·954	73·0	51·8	21·2	62·3	− 0·3	57·8	54·0	8·3	17·8	0·6	75	129·7	45·6	65·3	63·5	6·3	15·6	0·000	0·0	0
28	..	29·992	67·5	49·6	17·9	60·5	− 2·1	57·9	55·6	4·9	9·3	1·6	85	93·6	42·9	65·5	63·5	0·1	15·6	0·000	0·0	0
29	In Equator	30·067	83·4	59·8	23·6	70·1	+ 7·5	65·1	61·2	8·9	18·4	0·8	73	134·2	55·2	65·8	63·8	12·4	15·5	0·000	2·0	0
30	..	30·084	83·4	56·9	26·5	68·4	+ 5·8	63·8	60·1	8·3	20·2	0·2	75	137·2	52·2	66·3	64·7	9·3	15·5	0·000	0·0	0
31	..	29·832	88·2	56·1	32·1	71·6	+ 9·0	66·0	61·8	9·8	20·9	0·0	71	142·6	47·6	67·3	65·1	9·5	15·4	0·000	0·0	0
Means	..	29·746	72·8	52·1	20·7	61·5	− 1·1	57·1	53·3	8·2	17·2	1·2	75·0	122·9	46·3	65·8	63·8	5·7	16·0	Sum 2·457	5·2	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on July 2, 4, 19, and 30 for Air Temperature, and on July 2, 3, 30, and 31 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The mean reading of the *Barometer* for the month was 29in·746, being 0in·063 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 88°·2 on July 31; the lowest in the month was 42°·6 on July 8; and the range was 45°·6.
The mean of all the highest daily readings in the month was 72°·8, being 1°·7 *lower* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 52°·1, being 1°·1 *lower* than the average for the 36 years, 1841–1876.
The mean daily range was 20°·7, being 0°·6 *less* than the average for the 36 years, 1841–1876.
The mean for the month was 61°·5, being 1°·1 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	Wind as deduced from Self-Registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
July 1	Variable	NNW : W	0·4	0·0	0·0	141	v : v : 10, th.-r	10, r : 5, ci, ci.-s
2	W : NW	W : WSW	0·3	0·0	0·0	191	v : 10	9, cu.-s, cu, ci.-cu : v, oc.-shs : 3, cu.-s, ci.-cu
3	WSW : SW	SW	3·7	0·0	0·4	339	o : cu.-s, cu	8 ci.-cu, cu.-s : 10, sh.-r, t
4	SW : W	W : WSW	1·3	0·0	0·0	242	v : 4, ci, cu, ci.-cu, th.-r	4, cu.-s, ci.-cu, cu : 8, cu.-s, ci.-cu
5	WSW	SW	3·4	0·0	0·1	272	v : 3, cu.-s, ci.-cu	4, cu.-s, ci, ci.-cu, t : v, cu.-s, ci, ci.-cu, sl.-r : 10, r, t, l
6	WSW : W : WNW	W	2·7	0·0	0·1	240	6 : 6, cu.-s, cu	7, cu.-s, cu, ci, h.-r, t, l : v : 10
7	W : NW	WNW : N	2·7	0·0	0·2	272	o, l : 8, cu.-s, cu, h, sh.-r	7, cu.-s, cu, h.-r : 8, cu.-s : 8, cu.-s, ci.-cu, r, t, l
8	W : SW : NW	NW : W : SW	1·3	0·0	0·0	189	v : 7, ci.-cu, cu.-s, li.-shs	10, h.-r : 10, shs.-r
9	WSW : SW	WSW : SW	3·1	0·0	0·3	326	v : 10, oc.-sl.-r	10 : v, ci.-cu, cu.-s
10	SW : WSW	WSW	2·5	0·0	0·2	323	v : 1, li.-cl	1, ci : 10
11	W : WSW	W : WSW : WNW	0·8	0·0	0·1	279	li.-cl : 10	10 : v : 0
12	Variable	Variable	0·3	0·0	0·0	139	v : li.-cl : 6, cu.-s, cu, ci.-cu	6, cu.-s, cu, ci : 5, cu.-s, cu, ci : 2, th.-cl
13	SW : W	W : SW	2·8	0·0	0·2	243	v : 9, h	8, cu.-s, ci, cu : 8, cu, ci, r
14	SW	SSW : SE	3·3	0·0	0·3	331	10, th.-r : 10, th.-r	9, ci.-cu, cu.-s, r : 10, shs.-r : 10, h.-r
15	SW	SW	6·3	0·0	0·7	424	10 : 10, w, h.-shs	10, shs.-r, l, t : cu.-s, ci.-cu, cu : 0
16	SSW	SSW	3·8	0·0	0·4	361	v : 10, r	10, r : 10, shs.-r : 10, h.-r
17	SW	WSW	3·5	0·0	1·0	485	10, r : 10	10 : 10, r : 7, cu.-s, ci.-cu, cu
18	WSW	W : WSW	1·9	0·0	0·3	342	v : 7, cu.-s, cu, ci.-cu	7, cu, ci, ci.-cu, cu.-s : 10
19	WSW : SW	SW	2·4	0·0	0·1	223	10 : 10	10, shs.-r : 10
20	WSW : NW	WNW : W : WSW	3·1	0·0	0·2	365	v : 1, cu, ci	6, cu.-s, cu : v, cu.-s, cu : 3, th.-cl
21	WSW	WSW : SSW	1·8	0·0	0·2	314	3, cu.-s : 7, cu, cu.-s, ci	2, cu, ci : 5, cu
22	S : SW	SSW	0·7	0·0	0·0	273	v : 10	10 : 2
23	SSW	S : SSE	4·8	0·0	0·5	363	v . 10	10, r : 10, c.-r
24	SSW : WSW	SW : SSW	2·3	0·0	0·1	331	10, r : 8, cu, ci.-cu	7, ci.-cu, cu.-s : v, so.-ha : 2, li.-cl
25	SW : WSW	W : SW	1·3	0·0	0·1	320	o : 5, cu.-s	9, cu.-s, ci.-cu : v, r
26	S : SW : NW	NNW : NW	3·5	0·0	0·3	357	10, r : 10, th.-r	10 : 8, cu.-s, cu : 0
27	WSW	WSW : NW : N	0·2	0·0	0·0	230	v : 10, h	9, cu.-s, ci.-cu : 6, ci.-cu, ci
28	NNW : WSW	WSW	0·3	0·0	0·0	236	10 : 10, sl.-r	10, th.-r : v : 8, cu.-s, ci.-cu, ci
29	WSW	W : NW	1·0	0·0	0·1	304	v : 3, ci.-cu, ci	6, ci.-cu, cu, h : 0
30	WSW	WSW : SSW	0·0	0·0	0·0	203	o : o, h, mt	0 : 0
31	WSW	SW	0·3	0·0	0·0	214	o : o : 1, ci	5, cu, ci, ci.-cu : 6, cu, ci, cu.-s, l
Means	...	...	..	..	0·2	286		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 57°·1, being 0°·6 *lower* than
The mean *Temperature of the Dew Point* for the month was 53°·3, being 0°·4 *lower* than
The mean *Degree of Humidity* for the month was 75·0, being 2·0 *greater* than
The mean *Elastic Force of Vapour* for the month was 0in·407, being 0in·006 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 4gr·5, being 0gr·1 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 528 grains, being *the same as*
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·0.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·36. The maximum daily amount of *Sunshine* was 13·1 hours on July 21.

The highest reading of the *Solar Radiation Thermometer* was 144°·8 on July 5; and the lowest reading of the *Terrestrial Radiation Thermometer* was 35°·8 on July 8.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 2·6; for the six hours ending 3 p.m., 1·1; and for the six hours ending 9 p.m., 1·5.

The *Proportions of Wind* referred to the cardinal points were N. 3, E. 0, S. 9, and W. 19.

The *Greatest Pressure of the Wind* in the month was 6lbs·3 on the square foot on July 15. The mean daily *Horizontal Movement of the Air* for the month was 286 miles; the greatest daily value was 485 miles on July 17; and the least daily value 139 miles on July 12.

Rain fell on 15 days in the month, amounting to 2in·457, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·034 *greater* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Of the Water of the Thames off Greenwich. Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours.	hours.	in.		
Aug. 1	..	29·698	71·4	57·1	14·3	62·9	+ 0·3	56·9	51·8	11·1	19·6	3·4	68	123·1	57·0	68·1	65·3	2·3	15·3	0·010	0·0	0
2	Last Qr.	29·778	68·8	48·3	20·5	57·5	— 5·2	52·5	48·0	9·5	15·7	3·1	70	115·2	42·7	68·3	65·3	6·1	15·3	0·010	0·0	0
3	..	29·827	69·6	46·8	22·8	56·4	— 6·3	52·0	47·9	8·5	20·5	1·8	73	124·0	40·3	68·3	65·5	3·8	15·2	0·068	0·0	0
4	..	29·869	70·9	51·5	19·4	59·5	— 3·2	54·6	50·2	9·3	17·8	2·0	72	121·2	50·1	67·8	65·3	3·2	15·2	0·000	0·0	0
5	Greatest Declination N	29·897	78·7	52·5	26·2	64·5	+ 1·8	58·5	53·5	11·0	20·2	2·2	67	122·0	46·8	66·5	63·8	10·9	15·1	0·000	1·5	0
6	..	29·778	79·0	54·4	24·6	66·5	+ 3·8	58·8	52·6	13·9	24·8	3·8	62	118·7	47·4	66·3	64·3	2·0	15·1	0·020	8·2	0
7	..	29·476	71·3	59·5	11·8	63·5	+ 0·8	61·2	59·3	4·2	11·3	0·2	87	118·2	56·5	67·3	65·3	2·0	15·0	0·324	4·5	0
8	..	29·330	70·2	54·5	15·7	60·7	— 2·0	58·1	55·8	4·9	12·2	0·0	84	119·9	50·2	67·3	65·3	6·1	15·0	0·225	21·7	0:sN,sP
9	New, Perigee	29·464	73·0	57·2	15·8	62·2	— 0·5	58·8	55·9	6·3	12·4	1·9	80	123·7	55·2	66·9	65·3	4·3	14·9	0·116	12·7	0:sP:0
10	..	29·696	70·5	53·7	16·8	61·1	— 1·6	57·1	53·6	7·5	15·1	1·0	77	118·0	48·0	66·9	65·1	5·7	14·9	0·024	7·2	0 : W
11	In Equator	29·821	71·7	50·2	21·5	59·8	— 2·9	55·1	51·0	8·8	18·2	1·2	73	124·2	42·8	66·7	64·8	3·6	14·8	0·000	0·0	W : 0
12	..	29·879	72·8	49·2	23·6	60·3	— 2·3	56·0	52·3	8·0	14·8	2·2	75	126·9	40·5	66·3	64·3	3·9	14·7	0·000	3·0	0
13	..	29·751	70·7	58·5	12·2	63·0	+ 0·5	59·5	56·6	6·4	13·1	1·9	79	118·0	56·1	67·1	65·5	1·7	14·7	0·000	0·5	0
14	..	29·652	78·7	58·9	19·8	66·7	+ 4·3	61·4	57·2	9·5	22·6	0·6	72	124·5	54·2	68·3	66·5	10·1	14·6	0·000	3·2	0
15	First Qr.	29·745	79·6	55·1	24·5	64·2	+ 1·9	60·5	57·4	6·8	21·8	0·2	78	116·8	45·1	67·8	65·8	5·9	14·6	0·008	12·3	0
16	..	29·762	78·6	56·5	22·1	64·8	+ 2·7	60·6	57·3	7·5	15·0	1·1	76	143·7	49·7	67·1	65·3	6·2	14·5	0·000	4·7	..
17	..	29·787	75·9	54·1	21·8	64·3	+ 2·4	57·9	52·6	11·7	21·9	1·7	65	137·4	47·6	67·3	65·3	7·9	14·4	0·000	5·3	..
18	Greatest Declination S.	29·850	78·0	52·6	25·4	64·4	+ 2·6	58·6	53·8	10·6	18·5	3·2	68	134·8	42·7	66·7	64·1	3·4	14·4	0·000	3·0	..
19	..	29·646	78·2	60·7	17·5	69·1	+ 7·5	63·8	59·7	9·4	17·3	2·2	72	123·0	56·5	67·1	65·3	1·0	14·3	0·000	3·5	..
20	..	29·609	83·3	61·3	22·0	70·7	+ 9·3	65·7	61·9	8·8	20·2	1·5	74	137·3	58·1	68·3	66·3	5·8	14·3	0·012	15·5	..
21	..	29·462	76·1	58·8	17·3	66·1	+ 4·8	61·5	57·8	8·3	18·4	3·1	75	133·2	56·0	69·3	66·8	7·7	14·2	0·074	12·0	..
22	..	29·495	72·0	51·3	20·7	61·9	+ 0·6	57·1	53·0	8·9	20·2	0·0	73	133·3	43·0	68·3	66·3	8·3	14·1	1·054	12·0	..
23	Apogee. Full	29·830	67·6	47·9	19·7	56·8	— 4·4	50·8	45·3	11·5	24·1	2·1	66	127·7	39·4	67·5	65·7	10·1	14·1	0·000	0·0	..
24	..	29·988	70·4	40·5	29·9	55·9	— 5·2	49·7	43·9	12·0	24·3	0·4	65	123·5	30·5	67·1	65·3	8·3	14·0	0·000	3·0	..
25	..	29·614	63·2	54·9	8·3	58·9	— 2·1	56·6	54·5	4·4	7·4	0·8	86	87·0	52·9	66·3	64·5	0·3	13·9	0·535	6·8	..
26	In Equator	29·531	68·5	57·0	11·5	62·1	+ 1·2	59·6	57·5	4·6	9·9	0·0	84	108·8	55·0	66·1	64·3	1·5	13·9	0·173	5·0	..
27	..	29·707	70·0	56·8	13·2	63·5	+ 2·7	61·9	60·6	2·9	6·8	0·4	91	99·2	55·0	65·3	63·9	0·0	13·8	0·082	8·7	..
28	..	29·585	71·6	58·8	12·8	63·5	+ 2·8	60·2	57·5	6·0	13·0	1·5	81	124·3	53·0	65·3	63·9	3·6	13·8	0·039	9·0	..
29	..	29·782	73·3	53·0	20·3	62·2	+ 1·6	57·3	53·1	9·1	20·5	1·5	73	130·8	49·5	65·3	63·8	6·3	13·7	0·000	2·3	..
30	..	29·698	69·0	52·8	16·2	58·7	— 1·7	55·9	53·4	5·3	13·9	1·5	83	118·3	49·8	65·3	63·5	4·2	13·7	0·127	4·7	..
31	Last Qr.	29·721	68·3	50·2	18·1	56·7	— 3·6	52·0	47·6	9·1	18·2	2·6	72	133·1	43·7	64·3	63·1	10·4	13·6	0·004	6·5	..
Means	..	29·701	72·9	54·0	18·9	62·2	+ 0·3	57·7	54·0	8·3	17·1	1·6	74·9	122·9	48·9	67·0	65·0	5·1	14·5	Sum 2·905	5·7	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on August 17, 23, 24, and 31 for the Barometer, on August 17, 19, and 20 for Air Temperature, and on August 19 and 20 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The Electrical Apparatus was not in action after August 16 to the end of the year.

The mean reading of the *Barometer* for the month was 29in·701, being 0in·098 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 83°·3 on August 20; the lowest in the month was 40°·5 on August 24; and the range was 42°·8.
The mean of all the highest daily readings in the month was 72°·9, being 0°·2 *lower* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 54°·0, being 0°·9 *higher* than the average for the 36 years, 1841–1876.
The mean daily range was 18°·9, being 1°·0 *less* than the average for the 36 years, 1841–1876.
The mean for the month was 62°·2, being 0°·3 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	Wind as deduced from Self-Registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Aug. 1	N	NNW : NW	1·4	0·0	0·1	293	10, l, r : 10	8, ci.-cu, cu.-s : 10
2	W : NW	NW	2·2	0·0	0·1	294	v : 7, cu.-s, ci.-cu, ci.-s	8, cu.-s, cu, sh.-r : 3, cu.-s
3	WSW : W	W : NNW	2·1	0·0	0·2	327	v : 6, cu.-s, ci.-cu, ci	7, cu.-s, cu : 10, r : 10, r
4	WNW : W : NNW	N : NW : NE	0·0	0·0	0·0	141	v : 7, ci.-cu	7, ci.-cu : 10 : 10
5	SW : WSW	SW : SSE	0·0	0·0	0·0	169	10 : 0 : 2, cu	6, cu.-s, cu : 2, ci.-s
6	SSE : S	SSE : SSW	0·3	0·0	0·0	203	0 : 9, ci.-cu, cu.-s	9, ci.-cu, cu.-s, ci.-s, cu : 9, ci.-s, cu.-s, shs.-r
7	S : SSE : SSW	S : SW	3·4	0·0	0·2	268	10, shs.-r : 10, shs.-r	10, r : 10, r
8	SSW	SSW	3·5	0·0	0·8	412	v : 10, r	10, r : v, cu.-s, cu, shs.-r, t : v, r
9	SW	SW	2·7	0·0	0·5	418	10, r : 9, cu.-s, ci.-cu	9, cu.-s, ci.-cu : 10, h.-shs
10	SW	SW : WNW : WSW	1·8	0·0	0·0	265	10, r : 8, cu.-s, ci.-cu, cu, th.-r	10, shs.-r : 10 : 1, cu.-s
11	WSW : WNW : N	NNW : NW	0·0	0·0	0·0	188	v : 5, ci.-cu, cu	7, cu.-s, ci.-cu : 10
12	NNW : N : NNE	N	0·3	0·0	0·0	209	v : 9, ci.-cu, cu.-s	6, cu, cu.-s, ci.-cu : 8, cu.-s, cu
13	NNW : NNE	ENE	0·4	0·0	0·0	272	v : 10	10, th.-r : 10, sl.-r
14	E : ENE	ESE	0·0	0·0	0·0	187	v : 2, cu, ci	5, cu.-s, cu, ci.-cu : 1, ci.-s, l
15	S : SW	SW	0·4	0·0	0·0	176	v, th.-r : 10	6, ci.-cu, cu, cu.-s : 0, l
16	WSW	SW : SSW	0·6	0·0	0·0	242	v : 2, ci.-s, cu	6, ci, cu, ci.-cu, cu.-s : v
17	WSW	W : WNW : NW	2·1	0·0	0·0	342	v : 3, ci.-cu, cu.-s, cu	5, ci.-cu, cu : v
18	WSW : SW	SSW : S : SE	0·0	0·0	0·0	143	v : 3, ci.-s	10, sl.-r : v, cu.-s, ci.-s, ci.-cu
19	SE : SW	SW	4·6	0·0	0·3	283	v : 8, cu, ci.-cu, ci	9, cu, ci.-cu, cu.-s, ci, sl.-r : 8, cu, cu.-s, ci.-cu
20	SSW	SW : S	3·5	0·0	0·2	275	v : 6, ci.-s, ci	7, cu.-s, ci.-cu, sh.-r : 9, cu.-s, ci.-cu
21	SW	SW	9·7	0·0	1·8	508	v, sh.-r : 7, cu.-s, ci.-cu, cu, w	4, cu.-s, ci.-cu, cu, shs.-r, w : v, lu.-ha, r
22	SSW : SW	WSW	10·0	0·0	0·7	415	v, h.-r : 9, cu.-s, cu. ci.-cu, shs.-r	5, cu, ci.-cu, cu.-s, sh.-r, w : 1, li.-cl
23	NNW : NW : W	WNW : W : WSW	2·5	0·0	0·1	270	v : 2, ci.-cu, ci, h	6, ci.-cu, cu.-s, cu : 8, ci.-cu
24	SW	SSW : SSE : ESE	0·0	0·0	0·0	119	v : 7, cu, ci.-s	10, ci, ci.-s, th.-cl : 10
25	E : ENE	E : SE : SSW	2·9	0·0	0·3	261	10 : 10, r, t	10, r, t : 9, cu.-s, ci.-cu, cu : 9, h.-shs, t, l
26	SW : WSW : WNW	W : WSW : SW	6·1	0·0	0·5	365	10, r : 8, cu.-s, ci.-cu	10 : 10, th.-cl, r
27	SSE : SW : WSW	WSW	5·0	0·0	1·1	469	10, r : 10	10, th.-r : 10
28	WSW	WSW	13·7	0·0	2·2	573	10 : 10, r, w	5, ci.-cu, cu, st.-w : 10, sh.-r
29	WSW : WNW	WSW : SW : SSW	0·4	0·0	0·0	228	v : cu, cu.-s, ci.-cu, h	5, cu.-s, cu, ci.-cu : 6, ci.-cu, cu.-s
30	SW	SW	4·8	0·0	0·5	347	v : 4, ci.-cu, ci, shs.-r	10, shs.-r : 9, ci.-cu, cu, shs.-r : 3, cu, ci.-cu
31	SW : WSW	WSW : W	8·9	0·0	1·0	424	v : 8, ci, cu, ci.-cu, sl.-r, w	6, cu.-s, cu, th.-r, w : 0
Means	...	...	..	..	0·3	293		
Number of Column for Reference.	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 57°·7, being 0°·2 *lower* than
The mean *Temperature of the Dew Point* for the month was 54°·0, being 0°·4 *lower* than
The mean *Degree of Humidity* for the month was 74·9, being 1·6 *less* than
The mean *Elastic Force of Vapour* for the month was 0in·418, being 0in·006 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 4grs·6, being 0gr·1 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 526 grains, being 2 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·0.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·35. The maximum daily amount of *Sunshine* was 10·9 hours on August 5.

The highest reading of the *Solar Radiation Thermometer* was 143°·7 on August 16; and the lowest reading of the *Terrestrial Radiation Thermometer* was 30°·5 on August 24.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·3; for the six hours ending 3 p.m., 1·2; and for the six hours ending 9 p.m., 1·2.

The *Proportions of Wind* referred to the cardinal points were N. 4, E. 3, S. 10, and W. 14.

The *Greatest Pressure of the Wind* in the month was 13lbs·7 on the square foot on August 28. The mean daily *Horizontal Movement of the Air* for the month was 293 miles; the greatest daily value was 573 miles on August 28; and the least daily value 119 miles on August 24.

Rain fell on 17 days in the month, amounting to 2in·905, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·579 *greater* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Difference. Greatest of 24 Hourly Values.	Difference. Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Of the Water of the Thames off Greenwich. Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours	hours	in		
Sept. 1	..	29·902	66·5	43·2	23·3	52·9	− 7·2	48·4	43·9	9·0	21·6	0·7	72	122·2	36·1	64·3	61·3	9·8	13·5	0·000	0·0	..
2	Greatest Declination N	29·787	69·4	44·0	25·4	53·4	− 6·6	49·3	45·2	8·2	20·0	0·0	74	129·6	38·2	63·5	61·3	7·8	13·4	0·006	0·0	..
3	..	29·591	60·7	47·2	13·5	52·5	− 7·3	51·0	49·5	3·0	7·6	1·0	90	102·8	42·6	63·3	61·3	0·0	13·4	0·790	0·0	..
4	..	30·086	63·9	47·0	16·9	52·8	− 6·9	49·3	45·8	7·0	16·9	1·7	78	119·7	42·5	63·1	61·3	5·8	13·3	0·000	0·0	..
5	..	30·116	66·2	40·1	26·1	53·1	− 6·4	48·6	44·1	9·0	19·4	0·0	71	115·3	34·5	62·3	59·5	9·5	13·2	0·000	0·0	..
6	Perigee	29·835	68·2	41·8	26·4	54·5	− 4·8	49·1	43·9	10·6	21·6	3·3	67	127·0	36·0	61·5	59·3	9·5	13·2	0·000	6·0	..
7	New	29·680	65·8	46·0	19·8	54·0	− 5·0	50·2	46·5	7·5	15·8	1·5	75	120·2	40·5	60·5	60·3	3·1	13·1	0·000	0·0	..
8	In Equator	29·778	62·2	44·3	17·9	52·9	− 5·9	48·1	43·3	9·6	16·5	3·4	70	115·1	38·4	60·6	60·3	2·0	13·0	0·000	0·0	..
9	..	29·812	65·5	49·1	16·4	56·0	− 2·5	51·3	46·9	9·1	16·2	3·6	71	121·9	45·4	60·3	58·5	2·4	13·0	0·000	0·0	..
10	..	29·834	63·7	50·7	13·0	57·1	− 1·2	54·3	51·7	5·4	12·1	1·6	82	86·1	46·8	60·3	58·3	0·7	12·9	0·006	1·2	..
11	..	29·656	73·4	52·5	20·9	60·0	+ 1·9	57·2	54·8	5·2	10·4	2·0	83	121·2	46·8	59·5	58·3	0·7	12·9	0·076	12·8	..
12	..	29·679	67·5	55·6	11·9	60·3	+ 2·3	56·0	52·3	8·0	15·5	3·2	74	122·4	49·0	60·3	58·3	5·8	12·8	0·000	14·1	..
13	..	29·808	66·3	52·5	13·8	59·5	+ 1·7	56·2	53·3	6·2	10·8	3·0	81	101·5	45·3	60·3	58·6	0·2	12·7	0·019	8·0	..
14	First Quarter Greatest Dec. S	29·778	67·1	59·1	8·0	62·2	+ 4·6	59·2	56·6	5·6	7·6	4·0	82	85·6	57·0	60·3	59·3	0·0	12·7	0·000	5·9	..
15	..	29·789	65·6	53·3	12·3	59·9	+ 2·5	56·4	53·3	6·6	12·9	1·9	80	101·4	45·0	60·3	59·6	1·4	12·6	0·048	5·0	..
16	..	30·103	65·2	44·5	20·7	53·9	− 3·4	51·1	48·4	5·5	15·0	0·0	81	112·0	35·4	60·3	59·3	3·6	12·6	0·000	0·0	..
17	..	30·124	60·1	45·5	14·6	53·3	− 3·8	50·5	47·7	5·6	10·1	0·8	81	102·8	36·9	61·3	59·6	1·9	12·5	0·000	0·0	..
18	..	30·132	61·4	49·8	11·6	54·8	− 2·1	50·8	47·0	7·8	13·5	2·0	75	111·1	44·1	59·3	58·3	2·9	12·4	0·000	0·0	..
19	Apogee	29·892	61·4	50·5	10·9	55·8	− 1·0	53·0	50·4	5·4	9·1	2·0	83	86·1	42·0	59·3	58·3	0·2	12·3	0·005	2·0	..
20	..	29·654	52·4	44·5	7·9	50·6	− 6·0	49·0	47·3	3·3	5·9	1·0	89	67·6	37·5	60·5	58·5	0·0	12·3	0·140	0·0	..
21	..	29·629	58·5	38·5	20·0	47·2	− 9·2	44·5	41·5	5·7	13·3	1·2	81	107·1	31·7	58·3	56·6	5·5	12·2	0·020	0·0	..
22	In Equator Full	29·749	59·5	39·0	20·5	47·5	− 8·7	44·1	40·3	7·2	15·6	0·5	77	113·8	31·3	57·3	55·3	6·7	12·2	0·000	0·0	..
23	..	29·755	57·9	43·0	14·9	48·6	− 7·5	46·1	43·4	5·2	11·0	2·3	83	76·7	38·3	57·3	54·8	0·4	12·1	0·005	0·0	..
24	..	29·887	61·3	42·5	18·8	49·7	− 6·2	45·9	41·9	7·8	16·7	2·1	75	112·3	39·6	57·1	54·8	4·1	12·0	0·000	0·0	..
25	..	30·041	54·9	33·3	21·6	45·6	−10·2	43·2	40·5	5·1	12·6	0·3	83	75·1	25·6	56·5	54·7	0·0	11·9	0·000	0·0	..
26	..	30·104	63·3	43·7	19·6	50·9	− 4·8	48·6	46·2	4·7	14·1	0·2	85	99·3	37·2	55·8	54·3	2·5	11·9	0·030	0·0	..
27	..	30·201	61·4	39·1	22·3	48·5	− 7·0	46·5	44·3	4·2	13·9	0·0	86	101·8	35·0	56·1	54·1	3·4	11·8	0·000	0·0	..
28	..	30·155	60·8	37·8	23·0	49·1	− 6·3	46·8	44·3	4·8	11·4	0·0	84	108·6	30·0	55·8	53·8	2·7	11·7	0·000	0·0	..
29	Greatest Declination N	30·057	63·7	41·6	22·1	50·7	− 4·5	48·3	45·8	4·9	16·7	0·0	84	107·8	28·2	55·5	53·8	6·6	11·7	0·000	2·0	..
30	Last Qr.	30·010	64·8	36·6	28·2	50·9	− 4·0	47·7	44·4	6·5	16·9	0·0	79	118·6	31·9	56·1	54·3	6·4	11·6	0·000	0·0	..
Means	..	29·887	63·3	45·2	18·1	53·3	− 4·2	50·0	46·8	6·5	14·0	1·4	79·2	106·4	39·0	59·6	57·9	3·5	12·6	Sum 1·145	1·9	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h. a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on September 1 for the Barometer, on September 1, 2, and 21 for Air Temperature, and on September 21 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The Electrical Apparatus was out of action throughout the month.

The mean reading of the *Barometer* for the month was 29in·887, being 0in·100 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 73°·4 on September 11; the lowest in the month was 33°·3 on September 25; and the range was 40°·1.

The mean of all the highest daily readings in the month was 63°·3, being 4°·4 *lower* than the average for the 36 years, 1841–1876.

The mean of all the lowest daily readings in the month was 45°·2, being 4°·0 *lower* than the average for the 36 years, 1841–1876.

The mean daily range was 18°·1, being 0°·4 *less* than the average for the 36 years, 1841–1876.

The mean for the month was 53°·3, being 4°·2 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY. 1877.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles		
Sept. 1	W : WNW	WSW : SW	0·7	0·0	0·1	229	v : 4, li.-cl	4, cu.-s, cu, ci : 1, ci.-cu
2	SW : WSW	SW : SE	1·5	0·0	0·0	175	o : 1, cu	3, cu, ci, sh.-r : 1, cu
3	E : ENE : N	N	10·2	0·0	1·2	525	v, r : 10, r	10, h.-r : 10, r, w
4	NNW : N	N : NE : SW	2·4	0·0	0·2	224	10 : 10 : 8, ci.-cu, cu.-s	6, ci.-cu, cu.-s : 5, mt
5	WSW : WNW	WSW : SW	0·3	0·0	0·0	170	v : 1, cu, h	3, cu : o
6	SW : WSW	Variable	0·1	0·0	0·0	127	o : 1, li.-cl	5, cu, cu.-s, ci.-cu : v : o
7	NNE : NE	ENE	3·9	0·0	0·2	250	o : 4, ci.-cu, ci	9, cu.-s, ci.-cu : 9, cu.-s, ci.-cu
8	ENE	E : ENE	7·5	0·0	0·9	369	v : 9, cu.-s, cu, ci.-cu, ci.-s	8, cu.-s, cu, ci.-s, w : 4, cu.-s, cu
9	ENE : E	ENE : NE	8·0	0·0	0·7	332	v : 10	7, cu.-s, ci.-cu, ci, w : 5, cu.-s, ci.-cu, cu
10	NE : E	E : ESE	0·0	0·0	0·0	122	v : 10, sh.-r	10 : 10, th.-cl, so.-ha : 10, th.-cl
11	SE : SSE	S : SW	3·8	0·0	0·4	280	v : 8, cu, ci.-cu	10, r : 10, r : o
12	SSW : SW	SW	10·0	0·0	2·2	516	10 : cu.-s, cu, ci.-cu, w	8, ci, ci.-s, cu.-s, cu, w, sl.-r : 10, r
13	SW	SW	10·5	0·0	1·5	477	10 : 10, oc.-sl.-r, w	10, shs.-r, w : 7, cu.-s, ci-cu, w, shs.-r
14	SW	SW	10·0	0·0	1·8	517	v, shs.-r, w : 10, sl.-r	10, oc.-th.-r : 7, cu, ci.-cu, ci.-s
15	SW : W	NNW : N	13·0	0·0	0·9	387	10, shs.-r : 10, sl.-r	10, w : 10
16	WSW : NW	NNW : N	0·2	0·0	0·0	146	10 : 10, h	10 : 10
17	NNW : N	N : NNE	3·0	0·0	0·2	302	v : 3, cu, ci.-cu, ci	9, cu.-s, ci.-cu, cu : 7, cu, ci.-cu, cu.-s
18	NNE : N	N	0·9	0·0	0·1	246	v : 10	7, cu.-s, ci.-cu, ci.-s, ci, cu : 8, cu.-s, ci.-cu, sl.-r : 10
19	NNE : N	NNW : N	0·6	0·0	0·0	210	10, sl.-r, mt, f	10, mt, f, sl.-r : 10, mt
20	NNW : W : NW	NNW : NNE : N	0·6	0·0	0·0	171	10 : 10, th.-r	10, r : 10
21	NNW : N	N : NNW	2·4	0·0	0·2	264	v : 2, th.-cl	9, cu.-s, ci.-cu, cu, r : v, th.-r : o
22	NNW : N	N : NW : WSW	1·3	0·0	0·0	221	o	6, cu, ci.-cu : 8, mt
23	W : NW	NW : N	0·5	0·0	0·0	225	r : 10, th.-r	10, th.-r : o
24	N : NW : W	N	2·0	0·0	0·1	207	v : 3, cu, cu.-s, ci.-cu	9 : 1, ci.-cu : o, d, sl.-f
25	N : NW : WSW	SW : WSW	0·0	0·0	0·0	136	v, h, f : 8, cu.-s, cu, ci.-cu, ci, h, f	10, mt, sl.-f : 10
26	SW	N : NW : SE	0·0	0·0	0·0	109	v, r : o, th.-f, h	5, ci.-cu, cu.-s : o
27	Variable	NE : E : SE	0·0	0·0	0·0	68	th.-f	1, ci, ci.-cu : 2, ci.-cu
28	NE	E	0·0	0·0	0·0	113	th.-f, h.-d : 2, cu, f	9, ci, cu, ci.-cu, cu.-s : o
29	NE : NNE	ESE : E : ENE	1·0	0·0	0·0	163	th.-f, h.-d	1, ci.-cu : o : o, f
30	NE : ENE	E : ENE	0·3	0·0	0·0	158	th.-f : o	5, cu : o
Means	...	...	..	..	0·4	241		
Number of Column for Reference.	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 50°·0, being 4°·3 *lower* than the average for the 20 years, 1849–1868.
The mean *Temperature of the Dew Point* for the month was 46°·8, being 4°·6 *lower* than the average for the 20 years, 1849–1868.
The mean *Degree of Humidity* for the month was 79·2, being 0·9 *less* than the average for the 20 years, 1849–1868.
The mean *Elastic Force of Vapour* for the month was 0^{in}·321, being 0^{in}·058 *less* than the average for the 20 years, 1849–1868.
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 3^{grs}·6, being 0^{gr}·6 *less* than the average for the 20 years, 1849–1868.
The mean *Weight of a Cubic Foot of Air* for the month was 539 grains, being 7 grains *greater* than the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·5.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·28. The maximum daily amount of *Sunshine* was 9·8 hours on September 1.

The highest reading of the *Solar Radiation Thermometer* was 129°·6 on September 2; and the lowest reading of the *Terrestrial Radiation Thermometer* was 25°·6 on September 25.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 0·7; for the six hours ending 3 p.m., 0·6; and for the six hours ending 9 p.m., 0·6.

The *Proportions of Wind* referred to the cardinal points were N. 11, E. 6, S. 5, and W. 7. One day was calm.

The *Greatest Pressure of the Wind* in the month was 13^{lbs}·0 on the square foot on September 15. The mean daily *Horizontal Movement of the Air* for the month was 241 miles; the greatest daily value was 517 miles on September 14; and the least daily value 68 miles on September 27.

Rain fell on 11 days in the month, amounting to 1^{in}·145, as measured in the simple cylinder gauge partly sunk below the ground; being 1^{in}·159 *less* than the average fall for the 36 years, 1841–1876.

MONTH and DAY. 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours.	hours.	in.		
Oct. 1	..	29·[illegible]	63·8	40·9	22·9	50·9	− 3·8	48·0	45·0	5·9	18·6	0·0	81	116·3	32·5	56·1	54·3	2·2	11·6	0·000	0·0	..
2	..	29·8[illegible]	60·2	37·8	22·4	48·1	− 6·3	45·6	42·9	5·2	17·1	0·0	83	105·0	30·8	55·5	54·1	5·4	11·5	0·000	0·0	..
3	..	29·843	[illegible]	31·4	25·6	45·9	− 8·1	43·7	41·3	4·6	12·7	0·0	85	100·0	28·6	55·3	53·7	3·7	11·4	0·000	0·0	..
4	..	[illegible]	60·5	31·0	29·5	46·1	− 7·6	43·6	40·8	5·3	13·5	0·0	83	93·4	25·6	54·8	53·3	1·8	11·4	0·000	0·0	..
5	In Perigee	30·2[illegible]	63·2	35·9	27·3	49·1	− 4·3	46·1	42·9	6·2	15·8	0·0	79	114·0	28·0	55·3	52·7	7·0	11·3	0·000	0·0	..
6	New	30·[illegible]4	63·0	36·1	26·9	49·6	− 3·4	46·4	43·0	6·6	17·3	0·0	78	118·1	26·4	54·3	52·3	6·8	11·2	0·000	0·0	..
7	..	30·293	53·4	33·8	19·6	46·1	− 6·0	44·9	43·6	2·5	5·8	0·0	92	65·0	28·8	54·3	52·1	0·0	11·2	0·000	0·0	..
8	..	30·019	55·6	42·7	12·9	50·3	− 2·2	46·3	42·1	8·2	16·6	3·6	74	105·4	37·6	53·8	51·8	2·2	11·1	0·024	0·0	..
9	..	30·120	55·6	39·1	16·5	46·5	− 5·8	43·3	39·7	6·8	12·2	2·6	78	105·3	31·2	54·3	51·7	4·1	11·0	0·000	0·0	..
10	..	29·939	53·2	35·4	17·8	46·6	− 5·3	44·1	41·3	5·3	10·0	0·0	83	78·5	29·2	53·8	51·3	0·0	11·0	0·000	0·3	..
11	..	29·730	56·5	45·8	10·7	51·1	− 0·8	47·0	42·7	8·4	16·4	1·2	73	96·6	42·0	53·8	51·3	6·2	10·9	0·212	0·7	..
12	Greatest Declination S.	29·796	57·4	43·5	13·9	49·1	− 2·6	45·1	40·8	8·3	15·4	3·5	73	98·3	37·4	53·1	51·1	5·1	10·9	0·000	2·0	..
13	..	29·714	61·4	45·9	15·5	55·6	+ 4·0	52·6	49·8	5·8	9·9	1·2	82	104·3	43·0	53·3	51·3	0·4	10·8	0·096	15·0	..
14	First Qr.	29·583	68·8	52·3	16·5	60·7	+ 9·3	54·6	49·3	11·4	20·9	4·2	66	111·7	46·5	53·7	51·7	6·7	10·7	0·000	13·5	..
15	..	29·592	64·7	42·9	21·8	53·5	+ 2·2	47·3	41·1	12·4	17·8	6·0	63	102·1	39·2	54·1	52·3	5·6	10·7	0·012	5·0	..
16	..	29·917	50·2	35·2	15·0	44·4	− 6·8	41·3	37·7	6·7	11·6	1·7	77	86·7	31·0	53·3	51·3	1·8	10·6	0·032	1·5	..
17	Apogee	30·164	53·7	31·7	22·0	41·2	− 9·9	38·3	34·7	6·5	15·8	0·0	78	97·8	28·0	53·1	50·3	5·7	10·5	0·000	0·0	..
18	..	30·182	50·9	28·2	22·7	39·2	−11·8	36·3	32·5	6·7	16·0	0·0	78	91·9	20·3	51·3	49·8	6·8	10·5	0·000	0·0	..
19	In Equator	30·093	56·4	30·6	25·8	43·8	− 7·0	40·3	36·2	7·6	13·8	2·3	74	80·6	24·4	51·3	48·8	0·4	10·4	0·000	0·0	..
20	..	29·983	60·9	41·7	19·2	50·5	− 0·1	46·2	41·7	8·8	18·2	3·4	73	109·0	36·0	51·3	48·8	8·0	10·3	0·000	1·0	..
21	..	29·75[illegible]	56·4	44·5	11·9	52·9	+ 2·5	48·8	44·7	8·2	13·8	2·7	74	61·9	37·1	50·3	48·3	0·0	10·3	0·008	8·2	..
22	Full	29·622	62·6	46·5	16·1	55·4	+ 5·3	52·9	50·5	4·9	9·5	1·7	84	98·1	42·0	50·8	48·5	1·6	10·2	0·165	12·0	..
23	..	29·38[illegible]	56·7	41·5	15·2	47·9	− 1·8	46·8	45·6	2·3	6·7	0·0	92	61·2	36·0	..	..	0·0	10·2	0·346	7·1	..
24	..	29·34[illegible]	54·5	38·4	16·1	46·4	− 3·0	43·6	40·4	6·0	14·4	0·2	81	95·2	32·7	..	..	6·8	10·1	0·016	5·9	..
25	..	29·154	52·9	45·7	7·2	50·8	+ 1·7	50·0	49·2	1·6	3·8	0·2	94	60·5	42·8	..	..	0·0	10·0	0·441	5·2	..
26	Greatest Declination N.	29·605	54·2	44·3	9·9	48·8	0·0	47·5	46·1	2·7	6·4	0·6	91	69·2	39·0	..	..	1·7	10·0	0·004	2·0	..
27	..	29·752	57·5	44·2	13·3	51·3	+ 2·8	49·7	48·1	3·2	7·4	1·1	89	86·7	39·1	51·1	49·3	0·7	9·9	0·252	10·0	..
28	..	29·89[illegible]	56·9	43·7	13·2	48·6	+ 0·7	46·3	43·5	5·4	12·7	1·3	82	91·1	37·3	50·3	48·7	4·4	9·8	0·005	1·5	..
29	Last Qr.	29·627	58·4	44·1	14·3	55·5	+ 5·6	52·0	50·5	3·0	5·0	0·2	90	59·8	39·9	51·3	49·3	0·0	9·8	0·168	10·5	..
30	..	29·581	61·9	46·8	15·1	54·5	+ 6·9	52·6	50·8	3·7	9·7	0·0	87	103·7	40·0	51·8	50·1	1·7	9·7	0·000	2·4	..
31	..	29·946	57·3	47·7	9·6	52·2	+ 4·9	47·2	42·1	10·1	14·0	4·9	69	92·2	39·8	51·9	50·3	4·3	9·7	0·000	3·1	..
Means	..	29·8[illegible]1	58·0	40·4	17·6	49·4	− 1·7	46·1	43·2	6·1	12·9	1·4	80·2	92·2	34·6	53·1	51·1	3·3	10·6	Sum 1·781	3·4	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h. a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on October 23 for the Barometer, on October 17 and 23 for Air Temperature, and on October 23, 28, and 29 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The Electrical Apparatus was out of order throughout the month.

The mean reading of the *Barometer* for the month was 29in·851, being 0in·131 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 68°·8 on October 14; the lowest in the month was 28°·2 on October 18; and the range was 40°·6.
The mean of all the highest daily readings in the month was 58°·0, being 0°·4 *lower* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 40°·4, being 3°·4 *lower* than the average for the 36 years, 1841–1876.
The mean daily range was 17°·6, being 3°·0 *greater* than the average for the 36 years, 1841–1876.
The mean for the month was 49°·4, being 1°·7 *lower* than the average for the 20 years, 1849–1868.

MONTH and DAY, 1877.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Oct. 1	NNE: N: NNW	N: NNE	0·0	0·0	0·0	137	v : 4, ci.-cu, cu, ci.-s	9, ci.-cu, cu: 10 : 10
2	SW: N	NNE: ENE	0·0	0·0	0·0	79	10, mt, f	1, cu : 0 : 0, f
3	Calm	NE: E	0·0	0·0	0·0	95	0, th.-f	4, cu, ci.-cu : 0, mt, f
4	N	E: ENE	0·0	0·0	0·0	106	v, mt, th.-f	7,cu,ci.-cu,cu.-s : v : 2, cu.-s, ci.-cu, f
5	NE	E: ENE: ESE	1·2	0·0	0·1	177	0, th.-f : 1, ci.-s, h	6, ci.-cu, cu.-s : 0, h.-d
6	NE	ENE: ESE: E	0·3	0·0	0·0	158	0, sl.-f : 0	1, ci.-s, ci, so.-ha : 1, ci.-s, h.-d
7	NW: SW	WSW: WNW: NW	0·8	0·0	0·0	173	th.-f : 10, f, so.-ha	10, f : 10, f, sl.-r
8	NNW: N	N	11·1	0·0	1·2	466	10, r : 10, w	9, cu.-s, cu, w : vv, sl.-r
9	NNW: N: NNE	NNE	2·4	0·0	0·3	274	0, h.-d : 1, ci.-s	7, ci.-cu, cu.-s : 10
10	SW	SW	2·0	0·0	0·1	240	10, sl.-f, h	10 : 10
11	SW: NW	W: WSW	8·6	0·0	0·7	427	v, h.-r, sq : 1, cu	5, ci, cu, ci.-cu, cu.-s, ci.-s : 10
12	WSW: W	WNW: SSW	3·2	0·0	0·4	349	v : 1, ci	8,cu.-s, cu, ci, ci.-cu, so.-ha : 9, f
13	SW	SW	8·7	0·0	2·3	556	10, r : 10, w, sc	10, st.-w, th.-r : 10
14	SSW: SW	SSW: SSE: S	9·2	0·0	1·1	402	v : 1, ci.-cu	1, ci, ci.-cu, w : 2, cu, ci.-cu
15	SW: W	WSW	23·0	0·3	4·5	710	v, h.-g : 10, st.-w	5,ci.-cu,cu,ci.-s,w: v, w : 0, w
16	WSW: WNW	NNW: NW: WSW	8·9	0·0	1·3	438	0, w : 1, ci.-s	10, r : v : 7, cu, mt, h.-d
17	WSW	NW: NNW: WSW	3·8	0·0	0·4	275	0, mt, h.-d : 0, h.-fr	9, cu.-s, cu, ci.-cu, sl.-r, hl : 10, f, h.-d
18	SW: W	W: SW: S	0·0	0·0	0·0	104	0, h.-d, mt : 0, h.-fr, th.-f	9, th.-cl : 1, ci.-s, h.-fr, mt
19	SW	SW: SSW	1·1	0·0	0·1	158	v, f, h.-fr : 10, f	10 : 10
20	SSW: SW	SW: SSW: S	0·7	0·0	0·1	222	v : 0	1,cu,ci.-cu,ci: v, th.-cl : 10, hu.-ha
21	S	SSW	11·5	0·0	0·7	339	10 : 10, sl.-r	10, th.-r : 10, th.-r, w
22	SW	SW	6·9	0·0	1·0	407	v : 4, cu, ci.-cu, th.-r	10, th.-r, w : 10, shs.-r
23	SW: SE	SW	7·0	0·0	0·3	308	v : 10	10, oc.-r, w : 1, ci.-s, ci, h.-d
24	WSW	WSW: SW	2·4	0·0	0·4	320	0, h.-d : 0	5, ci.-cu : 10, r
25	SSW: SE	NE: N: NNW	0·0	0·0	0·0	185	10, r : 10, r	10, c.-r : 10, c.-r : 10
26	NNW: N	SW: SSW	0·0	0·0	0·0	139	10 : 10	v, sl.-f, mt : 0
27	SSW	SSW: SW	3·3	0·0	0·4	357	v : 10	9,ci.-cu,cu,cu.-s,h.-r: 9, li.-shs : 2, ci, ci.-s
28	WSW: W	W: SW: SSW	1·3	0·0	0·1	294	v : 2, ci.-cu, mt	4 cu,ci.-cu,cu.-s : 0 : 0
29	S: SSW	SSW: SW: WSW	9·0	0·0	1·3	449	v : 10, r	10, r, st.-w : 10, oc.-shs : v
30	WSW: SW	SW: WSW	8·0	0·0	1·2	495	v : 9, cu.-s, cu, ci.-cu	7,ci,cu,ci.-cu,w : 10, th.-r, w : 10, th.-r, w
31	W	W: WSW	8·0	0·0	1·3	490	v, w : v, cu, ci.-cu	8,cu.-s,ci.-cu: 10 : v
Means	...	...	..	..	0·6	301		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 46°·4, being 2°·5 *lower* than
The mean *Temperature of the Dew Point* for the month was 43°·2, being 3°·6 *lower* than
The mean *Degree of Humidity* for the month was 80·2, being 5·9 *less* than
The mean *Elastic Force of Vapour* for the month was 0in·279, being 0in·042 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 3grs·2, being 0gr·4 *less* than
The mean *Weight of a Cubic Foot of Air* for the month was 543 grains, being 4 grains *greater* than
} the average for the 20 years, 1849-1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·3.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·31. The maximum daily amount of *Sunshine* was 8·0 hours on October 20.

The highest reading of the *Solar Radiation Thermometer* was 118°·1 on October 6; and the lowest reading of the *Terrestrial Radiation Thermometer* was 20°·3 on October 18.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 2·2; for the six hours ending 3 p.m., 0·8; and for the six hours ending 9 p.m., 0·4.

The *Proportions of Wind* referred to the cardinal points were N. 6, E. 2, S. 10, and W. 12. One day was calm.

The *Greatest Pressure of the Wind* in the month was 23lbs·0 on the square foot on October 15. The mean daily *Horizontal Movement of the Air* for the month was 301 miles; the greatest daily value was 710 miles on October 15; and the least daily value 79 miles on October 2.

Rain fell on 13 days in the month, amounting to 1in·781, as measured in the simple cylinder gauge partly sunk below the ground; being 1in·155 *less* than the average fall for the 36 years, 1841–1876.

MONTH and DAY. 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Lowest.	Daily Range.	Mean of 24 Hourly Values.	Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with blackened bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°	hours.	hours.	in.		
Nov. 1	..	30·200	54·7	39·0	15·7	47·0	0·0	44·1	40·8	6·2	11·4	1·4	80	80·4	35·5	51·9	50·3	2·6	9·6	0·000	0·0	..
2	Perigee	29·979	55·0	36·8	18·2	46·6	− 0·1	44·2	41·5	5·1	11·2	0·0	83	90·6	30·0	51·9	50·3	1·1	9·5	0·008	2·0	..
3	..	29·853	52·9	36·7	16·2	47·1	+ 0·7	44·2	40·9	6·2	12·6	0·8	80	79·3	27·5	51·7	50·3	5·1	9·5	0·012	0·0	..
4	..	29·734	56·0	33·2	22·8	45·5	− 0·3	43·3	40·8	4·7	11·0	0·8	84	88·6	24·4	51·5	49·3	1·8	9·4	0·010	1·8	..
5	New	29·617	58·2	46·8	11·4	51·3	+ 5·7	48·8	46·2	5·1	11·2	1·1	83	96·2	41·0	50·3	48·8	3·4	9·4	0·000	5·2	..
6	..	29·541	58·2	48·5	9·7	54·7	+ 9·5	53·4	52·1	2·6	4·6	1·7	91	61·2	45·4	51·3	48·7	0·0	9·3	0·094	3·5	..
7	..	29·488	57·2	49·5	7·7	53·9	+ 9·2	52·8	51·7	2·2	4·6	0·6	92	65·6	46·0	51·3	49·3	0·0	9·2	0·300	7·5	..
8	Greatest Declination S	29·660	58·7	45·3	13·4	50·0	+ 5·7	48·1	46·1	3·9	10·2	0·0	87	96·8	41·0	52·3	50·3	4·9	9·2	0·000	2·3	..
9	..	29·440	55·3	47·5	7·8	52·6	+ 8·8	51·1	49·6	3·0	5·6	1·0	90	60·6	43·0	52·3	50·3	0·0	9·1	0·132	20·5	..
10	..	29·227	56·0	44·7	11·3	50·7	+ 7·3	48·2	45·6	5·1	8·4	1·9	83	87·4	42·0	52·5	50·3	2·6	9·1	0·190	8·3	..
11	..	29·010	52·7	45·5	7·2	50·1	+ 7·1	47·7	45·2	4·9	6·4	1·8	84	54·4	40·8	51·8	50·3	0·0	9·0	0·278	15·5	..
12	First Qr.	28·782	51·8	39·3	12·5	45·2	+ 2·6	43·1	40·7	4·5	9·7	0·7	85	88·0	36·8	52·1	49·8	3·6	9·0	0·585	15·3	..
13	Apogee	29·233	46·7	40·2	6·5	43·6	+ 1·3	42·9	42·1	1·5	2·4	0·7	94	65·4	33·2	51·3	49·1	0·3	8·9	0·000	5·2	..
14	..	29·915	51·0	34·1	16·9	42·6	+ 0·6	41·4	40·0	2·6	10·3	0·0	90	77·2	29·6	50·1	48·1	4·9	8·9	0·000	1·3	..
15	In Equator	30·106	54·2	43·1	11·1	51·4	+ 9·6	50·1	48·8	2·6	6·7	0·6	91	60·6	38·0	49·3	46·9	0·0	8·8	0·069	5·2	..
16	..	30·128	58·0	37·5	20·5	51·2	+ 9·6	49·0	46·7	4·5	11·0	0·6	85	69·8	30·8	49·1	46·3	1·1	8·8	0·010	4·5	..
17	..	30·200	49·8	31·9	17·9	39·9	− 1·6	38·5	36·7	3·2	9·9	0·0	89	62·9	27·8	49·3	46·8	1·0	8·7	0·000	0·0	..
18	..	29·944	50·1	36·3	13·8	44·3	+ 2·8	42·9	41·2	3·1	6·5	0·5	89	61·8	31·4	48·3	46·3	0·7	8·7	0·000	1·8	..
19	..	29·665	49·4	33·6	15·8	43·0	+ 1·6	41·9	40·6	2·4	5·5	0·2	91	70·3	28·6	47·3	45·3	0·7	8·6	0·230	5·2	..
20	Full	29·462	44·7	35·6	9·1	39·9	− 1·4	37·9	35·4	4·5	9·0	1·7	84	74·4	31·0	47·3	45·3	2·6	8·6	0·000	0·0	..
21	..	29·494	52·0	34·0	18·0	42·7	+ 1·5	41·5	40·1	2·6	6·2	0·0	90	52·5	30·2	45·5	44·3	0·0	8·5	0·134	6·8	..
22	Greatest Declination N.	29·061	55·2	42·7	12·5	48·1	+ 7·0	45·3	42·2	5·9	11·8	1·9	81	80·1	39·5	45·3	43·8	2·5	8·5	0·068	7·0	..
23	..	29·375	48·1	37·0	11·1	43·6	+ 2·6	39·5	34·6	9·0	12·4	4·1	71	77·0	33·0	45·3	43·8	5·4	8·4	0·000	5·2	..
24	..	29·211	42·8	34·6	8·2	39·4	− 1·6	38·7	37·8	1·6	3·9	0·0	94	47·2	29·1	45·3	43·3	0·0	8·4	0·689	1·0	..
25	..	29·550	42·7	33·0	9·7	38·9	− 2·0	36·4	33·1	5·8	11·9	1·5	81	53·8	28·0	44·9	42·7	2·4	8·3	0·000	3·0	..
26	.	29·678	48·2	31·9	16·3	40·4	− 0·4	39·2	37·7	2·7	6·7	0·3	90	70·3	27·1	44·5	42·7	0·9	8·3	0·033	1·5	..
27	Perigee Last Quarter	29·082	52·5	42·0	10·5	48·1	+ 7·3	46·7	45·2	2·9	5·8	0·4	90	68·0	39·0	44·3	42·1	0·3	8·2	0·368	5·2	..
28	..	29·086	46·8	38·5	8·3	42·3	+ 1·4	40·1	37·4	4·9	9·9	1·4	84	76·0	35·0	43·8	41·3	5·6	8·2	0·000	2·2	..
29	In Equator	28·810	48·9	36·9	12·0	44·1	+ 3·1	42·0	39·5	4·6	6·6	2·2	83	59·5	33·0	44·3	41·7	1·0	8·2	0·319	4·5	..
30	..	28·920	47·0	38·2	8·8	42·0	+ 0·8	40·1	37·7	4·3	6·6	1·5	86	74·2	33·6	43·3	40·8	2·1	8·1	0·000	4·5	..
Means	..	29·516	51·8	39·1	12·7	46·0	+ 3·3	44·1	41·9	4·1	8·3	1·0	86·2	71·7	34·4	48·6	46·6	1·9	8·8	Sum 3·529	4·9	..
Number of Column for Reference	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1840 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on November 11, 22, and 25 for Air Temperature, and on November 11 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye readings of self-registering thermometers.

The Electrical Apparatus was out of action throughout the month.

The mean reading of the *Barometer* for the month was 29in·516, being 0in·255 *lower* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 58°·7 on November 8; the lowest in the month was 31°·9 on November 17 and 26; and the range was 26°·8.

The mean of all the highest daily readings in the month was 51°·8, being 2°·9 *higher* than the average for the 36 years, 1841–1876.

The mean of all the lowest daily readings in the month was 39°·1, being 1°·7 *higher* than the average for the 36 years, 1841–1876.

The mean daily range was 12°·7, being 1°·2 *greater* than the average for the 36 years, 1841–1876.

The mean for the month was 46°·0, being 3°·3 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY. 1877.	WIND AS DEDUCED FROM SELF-REGISTERING ANEMOMETERS. OSLER'S. General Direction. A.M.	P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	ROBINSON'S. Horizontal Movement of the Air.	CLOUDS AND WEATHER. A.M.	P.M.
			lbs.	lbs.	lbs.	miles.		
Nov. 1	W : WSW	NW : SW	1·1	0·0	0·1	260	v : 0, mt	9 : cu.-s, ci.-cu, h : 0, f, sl.-mt
2	SW : S	SSW : S	2·2	0·0	0·1	204	0 : 10	9, cu.-s, ci.-cu, cu : 10, oc.-r
3	WSW : NW	NW : SW	1·8	0·0	0·1	258	10, r : 1, cu	6, cu : 1, li.-cl, d
4	SSW : SSE : S	S : SSW	3·5	0·0	0·2	243	0, d : 6, ci.-cu, cu, h	7, cu, ci.-cu, cu.-s : 10, oc.-r
5	SSW : SW	WSW : SW	2·6	0·0	0·5	380	v : 7, ci, cu, ci.-cu	6, cu.-s : 0 : 0, mt, h.-d
6	SSW	SSW	6·3	0·1	1·5	537	v : 10, r	10, r : 10, r : 10, oc.-r
7	SSW : W	WSW : SW : SSW	7·0	0·0	0·7	351	10, r : 10, r	10, oc.-r : v : 9
8	SW : WSW	WSW : SW : SSW	0·9	0·0	0·1	241	v : 6, ci.-cu, cu	6, cu, cu.-s : 0 : 0
9	SSW	SSW : SW	11·5	0·0	2·1	535	v : 10, r, w	10, c.-r, w : v, sl.-r, l, w
10	SSW	SSW	14·3	0·0	1·8	568	vv, h.-r, t, l, w : vv, sqs, shs.-r, w	8, cu.-s, ci.-cu, hl, h.-r, l : v, li.-shs
11	SSW : S	SSW	32·6	0·0	5·4	725	v : 10, th.-r, w	10, r, g : 10, r, h.-g, fr.-h.-sqs
12	WSW : SW : SSW	SSW : SSE	17·0	0·0	0·7	360	10, h.-r, w : v, shs.-r	v, cu, cu.-s, ci.-cu, ci.-s, sh.-r : vv, shs.-r
13	SSW : SW : WSW	SW	0·5	0·0	0·0	218	v : 6, cu.-s, ci.-cu, cu, h	v, ci.-cu, h : 0, mt : 0, mt, h.-d
14	WSW	SW : S : SSW	0·4	0·0	0·0	185	0, h.-d, mt : 1, f, h.-fr	1, ci, ci.-s : 0 : 4, ci.-cu, cu.-s, lu.-co
15	SSW	SSW	7·2	0·0	1·0	445	v, w : 10, r	10, sl.-r : 10
16	SSW : SW	NW : SW	2·6	0·0	0·4	319	10 : 10	8, th.-cl, cu : 0, h.-fr, sl.-f
17	SW	E	0·0	0·0	0·0	96	v, f : 9, cu, ci.-cu, f	5, f : 1, h, f : 6, f, l
18	SE : SSW	SW : NW	0·8	0·0	0·0	241	v : 10	ci, ci.-s : 0
19	SW : S	SSW : WSW : W	2·9	0·0	0·2	329	0 : 6, ci, ci.-cu, sl.-r	10, r : 10, r : v, d
20	WSW	NW : WNW : WSW	3·2	0·0	0·7	427	v, h.-fr : v, sl.-r	v, ci, cu.-s, h : 0 : 0
21	WSW : SW	S : SW	10·1	0·0	1·1	423	0 : 9, cu, ci.-cu, cu.-s, sl.-r	10, r : 10, h.-shs, st.-w
22	WSW	WSW	17·2	0·8	4·6	784	10, r, g : 7, cu, ci, ci.-cu, cu.-s, oc.-sl.-r, st.-w	4, cu, ci, ci.-cu, cu.-s, sl.-r, st.-w : v, ci.-cu, shs.-r, st.-w
23	W	WSW	19·5	0·0	4·2	710	v, g : 0, st.-w	3, cu, w : 5, th.-cl, lu.-ha
24	SW : E	E : NE	11·5	0·0	1·0	333	10, th.-cl, lu.-ha : 10, oc.-th.-r	10, c.-r : 10, h.-r, st.-w : 10, r, st.-w
25	N : NNW	NW : W : WSW	11·1	0·0	0·9	377	10, st.-w : 2, ci.-cu, h.-fr, h	5, th.-cl : 0, mt, h.-fr
26	SW : S	SSW : S	7·0	0·0	0·2	277	v : 9	7, ci, ci.-cu, cu.-s : 10, r : 10, c.-r, w
27	S : SW	SW : SE : W	3·2	0·0	0·3	309	10, r : 9, li.-cl	8, cu, cu.-s, ci.-cu : 10, h.-r : 10, oc.-th.-r
28	WSW	SW : S	3·5	0·0	0·4	379	10 : 7, ci, ci.-s, so.-ha	1, ci : 1, ci : v, d, th.-r
29	S : SSW	WSW : SW : S	9·2	0·0	1·0	439	v, th.-r, w : 10, r, st.-w	8, cu, ci, ci.-cu : 0 : v, r
30	S : SW : WSW	SW	2·5	0·0	0·3	372	v : 3, cu	8, cu.-s, ci.-cu., th.-r : 0
Means	...	...	..	..	1·0	378		
Number of Column for Reference	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 44°·1, being 2°·9 *higher* than
The mean *Temperature of the Dew Point* for the month was 41°·9, being 2°·6 *higher* than
The mean *Degree of Humidity* for the month was 86·2, being 1·1 *less* than
The mean *Elastic Force of Vapour* for the month was 0in·266, being 0in·026 *greater* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 3grs·1, being 0gr·3 *greater* than
The mean *Weight of a Cubic Foot of Air* for the month was 540 grains, being 9 grains *less* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 6·1.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·22. The maximum daily amount of *Sunshine* was 5·6 hours on November 28.

The highest reading of the *Solar Radiation Thermometer* was 96°·8 on November 8; and the lowest reading of the *Terrestrial Radiation Thermometer* was 24°·4 on November 4.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 3·6; for the six hours ending 3 p.m., 0·8; and for the six hours ending 9 p.m., 0·5.

The *Proportions of Wind* referred to the cardinal points were N. 2, E. 1, S. 15, and W. 12.

The *Greatest Pressure of the Wind* in the month was 32lbs·6 on the square foot on November 11. The mean daily *Horizontal Movement of the Air* for the month was 378 miles; the greatest daily value was 784 miles on November 22; and the least daily value 96 miles on November 17.

Rain fell on 18 days in the month, amounting to 3in·529, as measured in the simple cylinder gauge partly sunk below the ground; being 1in·329 *greater* than the average fall for the 36 years, 1841–1876.

MONTH and DAY, 1877.	Phases of the Moon.	BAROMETER. Mean of 24 Hourly Values (corrected and reduced to 32° Fahrenheit).	TEMPERATURE. Of the Air. Highest.	Of the Air. Lowest.	Of the Air. Daily Range.	Of the Air. Mean of 24 Hourly Values.	Of the Air. Excess of Mean above Average of 20 Years.	Of Evaporation. Mean of 24 Hourly Values.	Of the Dew Point. Deduced Mean Daily Value.	Difference between the Air Temperature and Dew Point Temperature. Mean Daily Value.	Greatest of 24 Hourly Values.	Least of 24 Hourly Values.	Degree of Humidity (Saturation = 100).	TEMPERATURE. Highest in the Sun's Rays as shown by a Self-Registering Maximum Thermometer with Blackened Bulb in vacuo placed on the Grass.	Lowest on the Grass as shown by a Self-Registering Minimum Thermometer.	Of the Water of the Thames off Greenwich. Highest.	Of the Water of the Thames off Greenwich. Lowest.	Daily Duration of Sunshine.	Sun above Horizon.	Rain collected in a Gauge whose receiving surface is 5 inches above the Ground.	Daily Amount of Ozone.	Electricity.
		in.	°	°	°	°	°	°	°	°	°	°		°	°	°	°					
Dec. 1	..	29·141	44·0	35·7	8·3	42·0	+ 0·5	41·0	39·8	2·2	5·1	0·9	92	51·7	31·3	43·5	41·3	0·0	8·1	0·351	2·0	..
2	..	29·783	47·4	35·7	11·7	41·5	— 0·3	40·3	38·8	2·7	6·7	0·2	91	75·0	31·1	44·3	41·5	2·5	8·1	0·023	0·0	..
3	..	29·970	46·2	38·5	7·7	44·5	+ 2·4	43·8	43·0	1·5	2·0	0·2	95	51·0	33·0	43·4	41·3	0·0	8·0	0·077	0·0	..
4	New	29·820	45·4	42·1	3·3	43·5	+ 1·1	42·8	42·0	1·5	4·0	0·2	94	50·3	41·8	42·5	40·3	0·0	8·0	0·024	0·0	..
5	Greatest Decl. S.	29·774	44·2	38·1	6·1	42·1	— 0·5	41·1	39·9	2·2	4·0	0·7	92	49·7	35·2	42·5	40·3	0·0	8·0	0·011	1·5	..
6	..	29·413	55·0	41·0	14·0	47·0	+ 4·3	45·3	43·4	3·6	7·0	1·3	88	77·0	38·0	42·8	40·3	0·3	8·0	0·210	5·2	..
7	..	29·717	48·6	37·2	11·4	43·9	+ 1·1	41·4	38·5	5·4	7·8	2·2	81	57·8	34·0	43·3	41·5	0·0	7·9	0·144	2·3	..
8	..	29·989	47·6	35·5	12·1	41·5	— 1·3	39·3	36·6	4·9	8·2	2·2	83	66·6	31·1	44·3	42·1	1·7	7·9	0·005	0·0	..
9	..	30·019	50·2	36·8	13·4	43·2	+ 0·4	41·1	38·6	4·6	10·9	1·4	83	71·7	31·4	44·3	42·1	1·9	7·9	0·000	0·0	..
10	..	29·823	39·0	29·5	9·5	35·4	— 7·3	34·4	32·8	2·6	6·4	0·0	91	42·8	24·8	44·3	42·3	0·0	7·9	0·000	0·0	..
11	Apogee	29·880	46·5	28·9	17·6	36·0	— 6·5	34·8	33·0	3·0	5·3	0·7	89	46·5	25·5	43·7	41·9	0·0	7·8	0·000	1·5	..
12	First Qr.	29·690	51·1	36·7	14·4	45·5	+ 3·3	42·7	39·5	6·0	9·6	1·7	80	72·2	32·7	43·3	41·3	1·0	7·8	0·090	4·5	..
13	In Equator	29·764	44·0	32·6	11·4	39·0	— 2·8	36·9	34·2	4·8	9·2	1·9	83	71·2	29·0	43·3	40·8	2·9	7·8	0·082	0·0	..
14	..	30·071	40·6	32·2	8·4	36·1	— 5·4	34·7	32·6	3·5	6·9	2·0	88	47·2	28·0	42·5	40·3	0·2	7·8	0·000	0·0	..
15	..	30·302	44·5	30·9	13·6	38·3	— 2·8	36·5	34·1	4·2	6·7	2·2	85	49·9	26·4	42·3	40·3	0·0	7·8	0·006	2·0	..
16	..	30·147	48·6	42·9	5·7	46·1	+ 5·3	44·2	42·0	4·1	6·1	2·0	87	53·6	39·3	41·1	39·3	0·0	7·8	0·000	0·0	..
17	..	30·193	48·3	43·8	4·5	46·1	+ 5·6	44·2	42·0	4·1	5·7	2·6	87	50·5	40·6	41·1	39·3	0·0	7·7	0·000	0·0	..
18	..	30·335	44·2	30·9	13·3	40·7	+ 0·5	39·1	37·1	3·6	6·6	0·0	87	51·7	25·4	41·8	40·3	1·5	7·7	0·000	1·0	..
19	..	30·430	39·2	29·7	9·5	33·2	— 6·8	33·1	32·9	0·3	4·4	0·0	99	43·2	25·0	41·8	40·3	0·0	7·7	0·000	0·0	..
20	Greatest Dec. N. Full	30·473	43·5	38·1	5·4	40·5	+ 0·7	40·2	39·9	0·6	2·6	0·0	98	48·3	38·0	41·8	40·3	0·0	7·7	0·034	0·0	..
21	..	30·323	44·8	39·3	5·5	42·2	+ 2·6	41·5	40·7	1·5	3·5	0·0	94	48·6	38·8	41·8	40·3	0·0	7·7	0·000	0·0	..
22	..	30·082	49·3	41·8	7·5	45·8	+ 6·4	44·6	43·2	2·6	4·6	0·0	91	53·2	38·6	42·3	40·3	0·0	7·7	0·000	1·3	..
23	Perigee	29·898	49·2	35·5	13·7	43·1	+ 3·8	40·3	36·9	6·2	11·0	1·7	79	56·2	29·4	42·3	40·3	2·1	7·7	0·025	3·7	..
24	..	29·666	45·9	33·6	12·3	39·7	+ 0·4	36·4	32·1	7·6	12·8	4·0	75	50·3	29·3	42·7	40·8	0·0	7·7	0·000	0·0	..
25	..	29·550	38·3	28·9	9·4	33·6	— 5·6	32·3	29·9	3·7	6·0	0·0	87	56·5	26·0	42·5	40·3	3·4	7·7	0·000	0·0	..
26	In Equator	29·218	38·5	29·7	8·8	34·6	— 4·5	33·0	30·4	4·2	9·9	0·0	84	55·7	28·0	42·3	40·3	3·7	7·8	0·015	0·0	..
27	Last Qr.	29·465	37·4	29·7	7·7	33·6	— 5·4	31·3	27·1	6·5	9·8	4·1	76	49·6	24·0	41·1	39·3	1·8	7·8	0·000	0·0	..
28	..	29·800	38·0	28·7	10·2	33·0	— 5·8	31·6	28·8	4·2	9·5	0·0	84	49·0	24·0	40·5	38·8	0·6	7·8	0·357	0·0	..
29	..	29·525	54·4	38·9	15·5	47·7	+ 9·0	46·5	45·2	2·5	4·8	0·0	92	71·3	35·0	40·1	38·1	0·6	7·8	0·140	0·5	..
30	..	29·519	51·5	45·7	5·8	49·2	+10·7	48·1	46·9	2·3	3·8	1·0	92	55·7	41·7	40·8	38·1	0·0	7·8	0·173	1·5	..
31	..	29·870	44·1	32·8	11·3	41·0	+ 2·7	38·3	34·9	6·1	8·8	3·0	79	57·0	28·8	41·3	38·5	2·8	7·8	0·000	0·0	..
Means	..	29·860	45·5	35·5	10·0	41·0	+ 0·2	39·4	37·3	3·6	6·8	1·2	87·3	55·8	31·8	42·4	40·4	0·9	7·8	Sum 1·764	0·9	..
Number of Column for Reference.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

The results apply to the civil day, excepting those in Columns 16 and 17, which refer to the 24 hours ending 9h a.m. of the day against which the readings are placed.

The mean reading of the Barometer (Column 2) and the mean temperatures of the Air and Evaporation (Columns 6 and 8) are deduced from the photographic records. The average temperature (Column 7) is that determined from the reduction of the photographic records from 1849 to 1868. The temperature of the Dew Point (Column 9) and the Degree of Humidity (Column 13) are deduced from the corresponding temperatures of the Air and Evaporation by means of Glaisher's Hygrometrical Tables. The mean difference between the Air and Dew Point Temperatures (Column 10) is the difference between the numbers in Columns 6 and 9, and the Greatest and Least Differences (Columns 11 and 12) are deduced from the 24 hourly photographic measures of the Dry-bulb and Wet-bulb Thermometers. The results on December 28 and 29 for the Barometer, on December 8 and 25 for Air Temperature, and on December 8 for Evaporation Temperature, depend partly on values inferred from eye-observations, on account of accidental loss of photographic register.

The values given in Columns 3, 4, 5, 14, 15, 16, and 17 are derived from eye-readings of self-registering thermometers.

The Electrical Apparatus was out of action throughout the month.

The mean reading of the *Barometer* for the month was 29in·860, being 0in·069 *higher* than the average for the 20 years, 1854–1873.

TEMPERATURE OF THE AIR.

The highest in the month was 55°·0 on December 6; the lowest in the month was 28°·7 on December 28; and the range was 26°·3.
The mean of all the highest daily readings in the month was 45°·5, being 0°·8 *higher* than the average for the 36 years, 1841–1876.
The mean of all the lowest daily readings in the month was 35°·5, being 0°·2 *higher* than the average for the 36 years, 1841–1876.
The mean daily range was 10°·0, being 0°·7 *greater* than the average for the 36 years, 1841–1876.
The mean for the month was 41°·0, being 0°·2 *higher* than the average for the 20 years, 1849–1868.

MONTH and DAY. 1877.	Wind as deduced from Self-registering Anemometers. Osler's. General Direction. A.M.	General Direction. P.M.	Pressure on the Square Foot. Greatest.	Least.	Mean of 24 Hourly Measures.	Robinson's. Horizontal Movement of the Air.	Clouds and Weather. A.M.	Clouds and Weather. P.M.
			lbs.	lbs.	lbs.	miles.		
Dec. 1	SSW	N	0·0	0·0	0·0	146	v, r : 10, h.-r, gt.-glm	5, ci, ci.-cu : v, ci.-cu, cu.-s, mt
2	NNE : NE	NE : NNE	2·1	0·0	0·1	273	v, sh.-r : 8, cu.-s, cu	3, cu, ci, ci.-s : vv, sl.-r : 1, cu.-s, d
3	NNE : NE	NE : NNE	1·3	0·0	0·1	270	v : 10, m.-r	10, m.-r : 10, m.-r
4	NNE : N	N	0·8	0·0	0·0	203	10 : 10, oc.-m.-r	10 : 10, fr.-m.-r
5	NNW : N	N : S : SSE	0·2	0·0	0·0	142	10 : 10, m.-r	10 : 10
6	SE : SSE : S	SSW : SW : WSW	8·5	0·0	1·0	425	10, r : 10, r, st.-w	v,cu,ci.-cu,li.-shs : v, th.-r : 0
7	WSW : SW	SSW : NW	4·3	0·0	0·6	325	v : 2, ci.-s, so.-ha	9, th.-cl : 10, r : 10, r
8	W : WSW : SW	WSW : SW	0·4	0·0	0·0	243	v : 1, ci	v, ci.-cu : 10, sn.-r
9	SSW : S	SSW : SSE	0·8	0·0	0·0	196	v : 10	5, cu, ci, cu.-s : 0, h.-fr
10	SE : E	ESE : ENE : W	1·1	0·0	0·0	141	v : 9, ci.-cu, cu.-s, h.-fr	10 : 0, h.-fr, f
11	W : SW	SW : SSW	3·2	0·0	0·1	206	h.-fr : 4, ci, sl.-f	10, mt : 10 : 10, r
12	SSW : SW	WSW	11·0	0·0	2·2	577	v, r, st.-w : 9, ci.-cu, cu.-s	6, cu.-s, ci.-cu : 1, ci : 1, ci.-cu
13	SW : WSW	WSW	2·7	0·0	0·5	349	v, h.-r : 1, ci	8, th.-cl : 1, th.-cl, mt, h.-fr
14	WSW : W	NW : WSW	0·9	0·0	0·1	291	v, h.-fr : 7, cu, ci.-cu, h.-fr, mt	5, th.-cl, mt : 0, mt, h.-fr
15	WSW	SW	2·5	0·0	0·2	304	v, h.-fr : 10	10 : 10, th.-r
16	WSW	W : WNW : NW	5·0	0·0	0·9	457	10 : 10	10 : 10, sl.-r
17	NW : W : WSW	WSW : W : WNW	1·8	0·0	0·1	272	10 : 10	10 : 10
18	NNW : N	N : WSW	1·9	0·0	0·1	204	v : 2, th.-cl, mt	5,ci.-s,cu.-s,ci.-cu,mt : 0, th.-f, h.-d, h.-fr
19	WSW : SW	SW	0·0	0·0	0·0	113	th.-f : 10, th.-f	10, th.-f : 10, f, m.-r
20	SE	SE : S : SW	0·0	0·0	0·0	67	10, f : 10, f, m.-r	10, m.-r : 10, m.-r : 10
21	S : WSW	SW : SSW	0·0	0·0	0·0	130	v : 10, m.-r	10, m.-r : 10, m.-r, mt
22	SSW	SW	6·1	0·0	0·8	408	10 : 10	10, w : 10, th.-r, w
23	WSW : NNW	NW : W : WSW	5·5	0·0	0·9	385	v, sl.-r : 5, th.-cl, so.-ha	9, th.-cl : 1, ci.-cu, h.-fr
24	WSW	NW : WNW	13·6	0·0	2·2	605	v : 10, st.-w	v, ci.-cu, st.-w : 0, w : 0
25	W : WSW	WSW : SW : SSW	0·6	0·0	0·0	236	v, h.-fr : 8, ci.-cu, h.-fr	8, cu, ci.-s, th.-cl, mt : 10
26	NE : W : WSW	W	6·0	0·0	0·7	376	v : 10, sl.-sn	1, ci, ci.-cu : 4
27	WNW	W	1·5	0·0	0·3	364	v, h.-fr : 1, cu.-s, h.-fr, mt	4, cu, ci.-cu, ci.-s : 0
28	W : WSW	SW : SSE : S	2·2	0·0	0·1	260	v, h.-fr : 5, cu, ci.-s, h.-fr	10 : 10, sn : 10, r
29	S : SW	WSW	2·5	0·0	0·4	421	10, r : 10, th.-r	10, th.-r : v : 2, cu.-s
30	WSW : SW	SSW : SW	8·5	0·0	0·6	426	v : 10, m.-r	10, m.-r : 10, m.-r : 10, h.-r, w
31	NW	NW : W	8·6	0·0	1·9	505	10, st.-w : 0, h	1, cu : 0 : 0, h.-fr
Means	...	...	..	..	0·4	301		
Number of Column for Reference.	23	24	25	26	27	28	29	30

The mean *Temperature of Evaporation* for the month was 39°·4, being 0°·1 *higher* than
The mean *Temperature of the Dew Point* for the month was 37°·3, being 0°·1 *lower* than
The mean *Degree of Humidity* for the month was 87·3, being 0·5 *less* than
The mean *Elastic Force of Vapour* for the month was 0in·223, being 0in·001 *less* than
The mean *Weight of Vapour in a Cubic Foot of Air* for the month was 2grs·6, being *the same as*
The mean *Weight of a Cubic Foot of Air* for the month was 552 grains, being 1 grain *greater* than
} the average for the 20 years, 1849–1868.

The mean amount of *Cloud* for the month (a clear sky being represented by 0 and an overcast sky by 10) was 7·1.

The mean proportion of *Sunshine* for the month (constant sunshine being represented by 1) was 0·12. The maximum daily amount of *Sunshine* was 3·7 hours on December 26.

The highest reading of the *Solar Radiation Thermometer* was 77°·0 on December 6; and the lowest reading of the *Terrestrial Radiation Thermometer* was 24°·0 on December 27 and 28.

The mean daily distribution of *Ozone* was, for the 12 hours ending 9 a.m., 0·7; for the six hours ending 3 p.m., 0·0; and for the six hours ending 9 p.m., 0·2.

The *Proportions of Wind* referred to the cardinal points were N. 6, E. 2, S. 9, and W. 14.

The *Greatest Pressure of the Wind* in the month was 13lbs·6 on the square foot on December 24. The mean daily *Horizontal Movement of the Air* for the month was 301 miles; the greatest daily value was 605 miles on December 24; and the least daily value 67 miles on December 20.

Rain fell on 17 days in the month, amounting to 1in·764, as measured in the simple cylinder gauge partly sunk below the ground; being 0in·041 *less* than the average fall for the 36 years, 1841–1876.

HIGHEST and LOWEST READINGS of the BAROMETER, reduced to 32° Fahrenheit, as extracted from the PHOTOGRAPHIC RECORDS.

MAXIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
January	2. 4.10	29·585
	4.23. 0	29·083
	5.20.30	29·169
	7.21.20	29·395
	9.14. 0	29·895
	12.23. 0	29·911
	15. 9. 0	29·972
	20.22. 0	30·499
	24. 6. 0	30·060
	26.14. 0	30·045
	27.11.30	30·092
	28.22.45	30·014
	30.23.30	29·947
February	1.14. 0	29·936
	2.22. 0	30·095
	4.12. 0	30·222
	7.23.15	30·044
	10.11. 0:	29·807
	11.12. 0	29·785
	14. 9.30:	29·865
	17.21. 0	29·935
	21.20. 0	29·912
	23. 9. 0	29·795
March	0.20.30	30·236
	4.22. 0	29·746
	5.23. 0	29·745
	10.22. 0	30·083
	14.13.30	29·789
	17.22. 0:	29·508
	22.12. 0:	29·665
	30.14.30	29·957

MINIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
January	0.21.30	28·568
	4. 1.40	28·983
	5. 6.40	29·018
	6.11. 0	28·886
	8. 4.30	29·283
	10.18. 0	29·451
	14. 8. 0	29·380
	18.17. 0	29·594
	23.17.30	29·875
	25. 3.20	29·406
	27. 2. 0	29·925
	28. 1.50	29·710
	29.22. 0	29·150
February	0.15. 0	29·725
	2. 7. 0	29·800
	3.16. 0:	29·875
	7. 3.50	29·944
	9.20. 0	29·708
	10.21.30	29·631
	12. 3.10	29·459
	15.16.40	29·504
	19.19.10	28·845
	22.10.20:	29·505
	25.18.10	28·955
March	4. 2. 0:	29·654
	5. 6. 0	29·695
	7. 3. 0	29·145
	12.15.40	29·535
	16. 3. 0	29·345
	20.15.30	29·055
	24.16.30	28·701

MAXIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
April	7.21. 0	29·534
	11.23.20	29·901
	14.12. 0	30·023
	19.22. 0	30·084
	26.11. 0	29·810
May	1.10.10	30·240
	9.21.15	29·410
	13. 9. 0	29·560
	15.21.30	29·950
	17.23.30	29·832
	24.21. 0:	30·075
	30.10. 0	29·505
	31. 8.30	29·523
June	2. 3. 0	29·753
	3.18.40	29·634
	5.10.50	29·932
	7. 9. 0	30·065
	8.23. 0	29·970
	15.11. 0:	30·020
	19.11. 0	29·951
	24.18.30	30·006
	27.20. 0	30·100
July	8.23. 0	30·155
	18.10.45	29·727
	20.10.40	29·877
	25. 8.50	29·822
	27.19. 0	30·025
	29.22. 0	30·135
August	4.22.30	29·923
	11.18.45	29·906
	15. 9. 0	29·800

MINIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
April	4. 3.40	28·800
	9.18.45:	29·315
	12.23.15	29·800
	17. 6.10	29·375
	23. 3. 0	29·380
	27.22. 0	29·535
May	9. 3.30	29·313
	10.17. 0	29·295
	14. 2.30:	29·455
	17. 6. 0	29·485
	19. 1.25	29·595
	28. 2.30	29·076
	30.21.30	29·395
June	1. 0. 0	29·245
	3. 6. 0	29·535
	4. 8.20	29·511
	6. 8. 0	29·740
	8. 7.50	29·828
	12. 3.15	29·666
	17. 4.20:	29·848
	22. 7. 0	29·377
	26. 5. 0	29·903
July	5.17. 0	29·670
	14.14.30	28·960
	19.14.40	29·598
	23.14. 0	29·290
	25.19. 0	29·575
	28. 5.30	29·940
August	0.15.40	29·630
	8.13. 0	29·297
	14. 4. 0	29·615

HIGHEST and LOWEST READINGS of the BAROMETER, reduced to 32° Fahrenheit, as extracted from the PHOTOGRAPHIC RECORDS—*continued.*

MAXIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
August	17. 21. 0	29·895
	19. 10. 0	29·715
	21. 7. 30	29·542
	23. 21. 0	30·027
	26. 9. 35	29·810
	28. 23. 0	29·845
September	0. 21. 0	29·936
	4. 10. 0	30·192
	9. 21. 0	29·855
	12. 23. 0	29·860
	14. 7. 0	29·820
	15. 22. 0	30·173
	17. 13. 0	30·195
	26. 22. 0	30·230
October	5. 22. 0:	30·497
	8. 22. 0	30·150
	12. 8. 0	29·880
	17. 9. 0	30·225
	24. 2. 0	29·385
	26. 10. 0	29·810
	28. 8. 0	29·979
	29. 22. 15	29·725

MINIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
August	16. 5. 0	29·730
	19. 0. 0	29·600
	20. 19. 25	29·363
	21. 21. 30	29·435
	25. 15. 0	29·217
	28. 2. 25	29·512
	30. 3. 0	29·666
September	2. 19. 30:	29·485
	6. 19. 0:	29·665
	11. 4. 0	29·552
	13. 15. 20	29·710
	14. 21. 0	29·615
	16. 6. 30	30·085
	20. 18. 0	29·585
October	2. 15. 0:	29·813
	7. 22. 0	29·980
	10. 16. 45	29·622
	14. 14. 0	29·315
	23. 4. 0	29·180
	25. 2. 0	29·042
	27. 4. 0	29·670
	29. 6. 30:	29·395
	30. 5. 20	29·470

MAXIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
November	0. 23. 0	30·245
	3. 9. 0	29·958
	5. 8. 0	29·705
	8. 6. 0	29·705
	10. 12. 0	29·269
	14. 21. 0	30·168
	16. 11. 0	30·288
	20. 15. 30	29·667
	23. 10. 0	29·563
	25. 11. 0	29·849
	27. 22. 20	29·120
December	2. 22. 0	30·011
	8. 13. 30	30·108
	10. 23. 0	29·940
	12. 9. 30	29·830
	14. 22. 0	30·374
	16. 21. 40	30·250
	19. 21. 0	30·515
	23. 10. 0	30·045
	24. 14. 0	29·653
	27. 22. 0	29·875
	29. 20. 0	29·635

MINIMA.

Approximate Greenwich Mean Solar Time, 1877.		Reading.
	d h m	in.
November	2. 14. 0:	29·695
	4. 13. 30:	29·532
	6. 17. 0:	29·432
	10. 4. 0:	29·194
	11. 12. 10	28·547
	15. 18. 0	30·022
	19. 22. 40	29·380
	22. 11. 10	29·031
	24. 8. 0:	28·905
	27. 6. 40	28·871
	28. 21. 0	28·664
December	6. 2. 30:	29·285
	10. 2. 0	29·795
	11. 21. 0	29·563
	13. 3. 0	29·715
	16. 2. 40	30·080
	17. 7. 0:	30·160
	22. 17. 30	29·723
	24. 1. 30	29·449
	25. 22. 0:	29·160
	29. 1. 0	29·446
	30. 11. 0	29·265

The readings in the above table are accurate, but the times are liable to some uncertainty. The time given is the middle of the stationary period. The symbol : denotes that the reading has been sensibly the same through a period of more than one hour. The readings at June $2^d. 3^h. 0^m.$, August $23^d. 21^h. 0^m.$, and September $0^d. 21^h. 0^m.$, are taken from the eye observations, on account of accidental interruption of the photographic registration.

ABSOLUTE MAXIMA AND MINIMA READINGS OF THE BAROMETER for each Month in the YEAR 1877.

[Extracted from the preceding Table.]

1877. MONTH.	Readings of the Barometer. Maxima.	Readings of the Barometer. Minima.	Range of Reading in each Month.
	in.	in.	in.
January	30·499	28·568	1·931
February	30·222	28·845	1·377
March	30·236	28·701	1·535
April	30·084	28·800	1·284
May	30·240	29·076	1·164
June	30·100	29·245	0·855
July	30·155	28·960	1·195
August	30·027	29·217	0·810
September	30·230	29·485	0·745
October	30·497	29·042	1·455
November	30·288	28·547	1·741
December	30·515	29·160	1·355

The highest reading in the year was 30in·515 on December 20. The lowest reading in the year was 28in·547 on November 12.

The range of reading in the year was 1in·968.

MONTHLY RESULTS of METEOROLOGICAL ELEMENTS for the YEAR 1877.

1877, Month.	Mean Reading of the Barometer.	Temperature of the Air. Highest.	Lowest.	Range in the Month.	Mean of all the Highest.	Mean of all the Lowest.	Mean Daily Range.	Monthly Mean.	Excess of Mean above Average of 20 Years.	Mean Temperature of Evaporation.	Mean Temperature of the Dew Point.	Mean Degree of Humidity. (Saturation = 100.)
	in.	°	°	°	°	°	°	°	°	°	°	
January ..	29·668	56·1	27·7	28·4	48·1	36·8	11·3	42·9	+ 4·1	41·4	39·6	88·7
February ..	29·752	59·1	24·7	34·4	49·2	38·3	10·9	44·0	+ 4·4	41·6	38·5	81·3
March	29·382	59·4	23·5	35·9	48·5	34·5	14·0	41·0	− 0·6	38·6	35·5	81·2
April	29·595	66·0	32·1	33·9	54·3	39·6	14·7	46·1	− 1·3	43·2	39·9	79·4
May	29·707	67·6	28·1	39·5	59·3	41·7	17·6	49·4	− 3·8	45·5	41·3	74·4
June	29·840	85·5	44·2	41·3	74·9	50·5	24·5	62·3	+ 2·6	56·2	51·0	67·0
July	29·745	88·2	42·6	45·6	72·8	52·1	20·7	61·5	− 1·1	57·1	53·3	75·0
August ...	29·701	83·3	40·5	42·8	72·9	54·0	18·9	62·2	+ 0·3	57·7	54·0	74·9
September.	29·887	73·4	33·3	40·1	63·3	45·2	18·1	53·3	− 4·2	50·0	46·8	79·2
October ...	29·851	68·8	28·2	40·6	58·0	40·4	17·6	49·4	− 1·7	46·4	43·2	80·2
November .	29·516	58·7	31·9	26·8	51·8	39·1	12·7	46·0	+ 3·3	44·1	41·9	86·2
December .	29·860	55·0	28·7	26·3	45·5	35·5	10·0	41·0	+ 0·2	39·4	37·3	87·3
Means	29·725	Highest 88·2	Lowest 23·5	Annual Range 64·7	58·2	42·3	15·9	49·9	+ 0·2	46·8	43·5	79·6

1877, Month.	Mean Elastic Force of Vapour.	Mean Weight of Vapour in a Cubic Foot of Air.	Mean Weight of a Cubic Foot of Air.	Mean Amount of Ozone.	Mean Amount of Cloud. (0–10.)	Rain. Number of Rainy Days.	Amount collected in a Gauge whose receiving Surface is 5 Inches above the Ground.	Wind. From Osler's Anemometer. Number of Hours of Prevalence of each Wind, referred to different Points of Azimuth. N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Number of Calm or nearly Calm Hours.	Mean Daily Pressure on the Square Foot.	From Robinson's Anemometer. Mean Daily Horizontal Movement of the Air.
	in.	grs.	grs.				in.	h	h	h	h	h	h	h	h	h	lbs.	miles.
January ...	0·243	2·8	547	4·4	6·8	23	4·347	25	25	31	39	220	238	113	36	17	0·67	370
February ..	0·233	2·7	547	2·2	7·4	18	1·710	75	13	0	0	19	218	268	79	0	0·81	408
March	0·208	2·4	547	3·7	7·2	17	2·230	120	46	29	64	70	200	165	46	4	0·55	307
April	0·246	2·8	542	9·7	8·4	20	3·349	53	162	127	84	99	119	48	28	0	0·57	308
May	0·260	3·0	540	7·8	7·1	10	1·376	141	136	92	47	70	180	53	11	14	0·35	279
June	0·374	4·1	529	10·6	5·0	7	0·683	32	79	136	43	81	214	85	30	0	0·45	284
July	0·407	4·5	528	5·2	7·0	15	2·457	23	11	2	12	54	311	267	64	0	0·19	286
August ...	0·418	4·6	526	5·7	7·0	17	2·905	44	27	35	45	96	267	156	74	0	0·34	293
September.	0·321	3·6	539	1·9	6·5	11	1·145	162	122	74	31	19	163	56	74	19	0·36	241
October ...	0·279	3·2	543	3·4	6·3	13	1·781	92	59	23	20	88	271	125	49	17	0·64	301
November .	0·266	3·1	540	4·9	6·1	18	3·529	13	5	20	25	197	294	128	40	0	0·99	378
December .	0·223	2·6	552	0·9	7·1	17	1·764	80	40	11	39	83	240	135	66	0	0·45	301
Sums	..	..	..	..	..	186	27·276	860	725	600	447	1096	2715	1649	597	71	..	..
Means	0·290	3·3	540	5·0	6·8	..	..	..	..	..	..	..	..	..	..	..	0·53	313

The greatest recorded pressure of the wind on the square foot in the year was 34 lbs. on April 16.
The greatest recorded daily horizontal movement of the air ,, ,, 893 miles on January 30.
The least recorded daily horizontal movement of the air ,, ,, 67 miles on December 20.

MONTHLY MEAN READING of the BAROMETER at every HOUR of the DAY, as deduced from the PHOTOGRAPHIC RECORDS, for the YEAR 1877.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1877.												Yearly Means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Midnight	29·669	29·749	29·594	29·600	29·726	29·839	29·753	29·704	29·890	29·849	29·527	29·842	29·728
1h. a.m.	29·666	29·747	29·589	29·598	29·723	29·834	29·748	29·696	29·887	29·847	29·522	29·841	29·725
2 „	29·671	29·745	29·584	29·595	29·718	29·829	29·740	29·692	29·887	29·843	29·522	29·843	29·722
3 „	29·668	29·739	29·578	29·594	29·713	29·828	29·737	29·688	29·879	29·840	29·519	29·847	29·719
4 „	29·662	29·736	29·574	29·592	29·709	29·829	29·738	29·685	29·876	29·837	29·515	29·842	29·716
5 „	29·662	29·734	29·576	29·593	29·710	29·835	29·740	29·688	29·876	29·841	29·515	29·837	29·717
6 „	29·662	29·732	29·577	29·598	29·712	29·841	29·747	29·694	29·880	29·846	29·521	29·838	29·721
7 „	29·664	29·731	29·583	29·603	29·715	29·847	29·752	29·701	29·888	29·856	29·526	29·844	29·726
8 „	29·668	29·740	29·587	29·606	29·718	29·852	29·756	29·704	29·893	29·865	29·534	29·853	29·731
9 „	29·670	29·745	29·594	29·608	29·717	29·854	29·758	29·707	29·897	29·867	29·539	29·864	29·735
10 „	29·670	29·753	29·595	29·608	29·716	29·855	29·755	29·708	29·899	29·868	29·540	29·873	29·737
11 „	29·674	29·761	29·591	29·605	29·716	29·853	29·757	29·706	29·897	29·868	29·540	29·872	29·737
Noon	29·664	29·761	29·589	29·599	29·707	29·844	29·755	29·704	29·892	29·860	29·531	29·862	29·731
1h. p.m.	29·655	29·756	29·583	29·592	29·703	29·837	29·751	29·701	29·888	29·851	29·522	29·855	29·725
2 „	29·653	29·752	29·577	29·587	29·699	29·836	29·747	29·702	29·883	29·843	29·515	29·856	29·721
3 „	29·654	29·747	29·569	29·576	29·694	29·830	29·741	29·695	29·878	29·840	29·510	29·859	29·716
4 „	29·658	29·749	29·567	29·574	29·692	29·828	29·738	29·696	29·875	29·836	29·507	29·864	29·715
5 „	29·663	29·755	29·567	29·576	29·689	29·827	29·735	29·695	29·875	29·838	29·505	29·871	29·716
6 „	29·667	29·763	29·573	29·579	29·690	29·829	29·736	29·696	29·879	29·847	29·502	29·874	29·720
7 „	29·676	29·767	29·580	29·585	29·692	29·833	29·739	29·704	29·888	29·851	29·498	29·877	29·724
8 „	29·680	29·769	29·584	29·596	29·698	29·838	29·743	29·712	29·893	29·852	29·498	29·879	29·729
9 „	29·684	29·773	29·583	29·600	29·706	29·849	29·748	29·714	29·898	29·854	29·498	29·882	29·732
10 „	29·686	29·771	29·584	29·603	29·708	29·856	29·750	29·716	29·900	29·857	29·496	29·881	29·734
11 „	29·688	29·770	29·584	29·607	29·707	29·856	29·746	29·715	29·899	29·856	29·494	29·882	29·734
Means	29·668	29·752	29·582	29·593	29·707	29·840	29·746	29·701	29·887	29·851	29·516	29·860	29·725

MONTHLY MEAN TEMPERATURE of the AIR at every HOUR of the DAY, as deduced from the PHOTOGRAPHIC RECORDS for the YEAR 1877.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1877.												Yearly Means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	°	°	°	°	°	°	°	°	°	°	°	°	°
Midnight	41·6	42·6	38·4	43·2	44·7	55·4	56·6	58·0	49·5	46·8	44·8	39·9	46·8
1h. a.m.	41·3	42·8	38·3	42·8	44·3	54·6	55·9	57·5	49·1	46·3	44·3	39·9	46·4
2 „	41·0	42·6	38·1	42·7	43·8	54·1	55·4	57·2	48·6	45·7	44·1	39·7	46·1
3 „	41·0	42·5	37·8	42·5	43·3	53·7	54·9	57·2	48·3	45·4	43·8	39·9	45·9
4 „	40·9	42·4	37·7	42·2	43·1	53·5	54·5	57·0	48·1	44·9	43·8	39·8	45·7
5 „	41·0	42·2	37·3	42·2	43·5	54·2	54·5	57·0	48·0	44·6	44·2	39·7	45·7
6 „	41·0	42·3	37·1	42·6	44·9	55·9	55·9	57·4	48·1	44·4	43·7	39·5	46·1
7 „	41·0	42·2	37·3	44·0	47·3	59·0	58·6	59·1	49·4	44·6	43·9	39·5	47·2
8 „	41·3	42·6	38·8	45·5	49·8	62·3	61·2	62·1	52·0	45·9	44·5	39·4	48·8
9 „	41·9	43·5	40·9	47·2	51·6	65·0	63·5	64·1	54·7	49·1	45·7	40·0	50·6
10 „	43·3	44·3	42·7	48·6	53·5	67·1	65·1	65·9	57·4	52·1	47·5	41·1	52·4
11 „	44·6	45·5	44·3	49·4	54·1	68·3	66·3	67·8	58·2	54·2	48·7	42·3	53·6
Noon	45·7	46·5	45·6	50·1	54·8	70·2	67·5	68·6	59·3	55·3	49·4	43·1	54·7
1h. p.m.	46·2	47·0	46·1	50·7	55·3	71·0	67·9	68·7	59·8	55·9	49·7	43·8	55·2
2 „	46·5	47·6	46·1	51·4	55·8	71·5	68·7	68·8	60·2	55·9	49·7	43·8	55·5
3 „	46·0	47·3	45·7	51·2	55·4	72·0	68·5	68·5	59·9	55·1	49·3	43·4	55·2
4 „	45·1	46·6	44·9	49·8	54·9	70·9	68·0	67·7	58·9	53·9	48·1	42·7	54·3
5 „	44·3	45·7	43·8	49·0	54·0	69·7	67·2	66·3	57·0	52·4	47·2	42·1	53·2
6 „	43·7	45·0	42·4	47·6	52·6	67·5	65·4	64·8	55·2	50·7	46·6	41·4	51·9
7 „	43·4	44·2	41·2	46·4	50·8	64·8	63·6	62·4	53·4	49·7	45·8	41·1	50·6
8 „	42·9	43·3	40·4	45·4	48·9	61·5	61·5	60·5	51·9	48·9	45·2	40·6	49·3
9 „	42·2	42·7	39·9	44·6	47·3	59·3	59·5	59·3	50·9	48·1	44·9	40·3	48·2
10 „	41·8	42·4	39·6	43·9	46·4	57·6	58·5	58·5	50·2	47·6	44·7	40·1	47·6
11 „	41·7	42·2	39·3	43·4	45·7	56·5	57·6	57·8	49·9	47·4	44·6	39·9	47·2
Means	42·9	44·0	41·0	46·1	49·4	62·3	61·5	62·2	53·3	49·4	46·0	41·0	49·9

MONTHLY MEAN TEMPERATURE of EVAPORATION at every HOUR of the DAY, as deduced from the PHOTOGRAPHIC RECORDS for the Year 1877.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1877. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly Means.
Midnight	40°.5	41°.0	37°.1	41°.5	42°.7	52°.7	54°.9	56°.0	47°.8	45°.1	43°.4	38°.6	45°.1
1h. a.m.	40.3	41.2	37.0	41.3	42.5	52.2	54.4	56.0	47.6	44.7	43.0	38.5	44.9
2 „	40.0	40.9	36.9	41.1	42.2	51.8	54.1	55.8	47.3	44.3	42.8	38.4	44.6
3 „	40.0	40.8	36.8	41.0	42.0	51.7	53.9	55.8	47.1	44.0	42.6	38.5	44.5
4 „	39.8	41.0	36.6	40.9	41.7	51.5	53.3	55.5	47.1	43.5	42.7	38.6	44.3
5 „	39.9	40.8	36.4	40.8	42.0	52.0	53.4	55.5	46.8	43.2	42.9	38.6	44.4
6 „	40.0	40.8	36.1	41.1	43.1	53.1	54.4	55.7	46.9	43.1	42.5	38.4	44.6
7 „	40.1	40.8	36.2	42.0	44.6	54.8	55.9	56.8	48.0	43.1	42.7	38.3	45.3
8 „	40.4	40.9	37.2	43.0	45.9	56.5	57.3	58.3	49.7	44.2	43.1	38.3	46.2
9 „	40.9	41.6	38.5	44.0	47.0	57.9	58.1	59.2	51.4	46.5	43.9	38.7	47.3
10 „	42.0	42.0	39.5	44.5	47.7	58.7	58.8	59.6	52.5	48.2	45.1	39.5	48.2
11 „	42.7	42.5	40.5	45.1	48.1	59.1	59.4	60.2	53.1	49.4	45.9	40.4	48.9
Noon	43.4	43.0	41.1	45.5	48.5	59.9	59.9	60.2	53.6	49.9	46.3	40.9	49.4
1h. p.m.	43.9	43.2	41.4	45.8	48.7	60.3	60.3	60.3	53.6	50.2	46.4	41.2	49.6
2 „	43.9	43.5	41.5	46.2	48.7	60.4	60.4	60.3	53.8	50.1	46.3	41.2	49.7
3 „	43.6	43.3	41.4	46.0	48.7	60.4	60.2	60.2	53.4	49.7	46.1	41.0	49.5
4 „	42.9	42.8	41.2	45.5	48.2	60.1	60.3	60.0	52.8	49.1	45.4	40.5	49.1
5 „	42.4	42.4	40.6	45.0	47.8	59.6	59.9	59.3	52.0	48.4	44.9	40.2	48.5
6 „	42.1	42.0	39.7	44.4	47.2	58.7	59.1	58.7	51.0	47.5	44.7	39.8	47.9
7 „	41.7	41.6	39.2	43.7	46.5	57.6	58.2	57.7	50.1	46.9	44.1	39.6	47.2
8 „	41.3	41.0	38.6	43.0	45.4	56.2	56.8	56.8	49.4	46.5	43.6	39.2	46.5
9 „	40.7	40.7	38.3	42.5	44.6	55.1	56.4	56.2	48.8	46.0	43.4	39.0	46.0
10 „	40.4	40.6	38.0	42.0	44.1	54.2	56.0	55.9	48.4	45.6	43.3	38.8	45.6
11 „	40.3	40.5	37.8	41.7	43.6	53.5	55.5	55.6	48.2	45.4	43.4	38.6	45.3
Means	41.4	41.6	38.6	43.2	45.5	56.2	57.1	57.7	50.0	46.4	44.1	39.4	46.8

MONTHLY MEAN TEMPERATURE of the DEW POINT at every HOUR of the DAY, as deduced by GLAISHER'S TABLES from the corresponding AIR and EVAPORATION TEMPERATURES, for the YEAR 1877.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1877. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly Means.
Midnight	39°.1	39°.1	35°.3	39°.5	40°.3	50.1	53.4	54°.2	46°.0	43°.2	41°.8	36°.9	43°.2
1h. a.m.	39.0	39.3	35.2	39.5	40.4	49.9	53.0	54.6	46.0	42.9	41.5	36.7	43.2
2 „	38.7	38.9	35.3	39.2	40.2	49.5	52.8	54.5	45.8	42.7	41.2	36.7	43.0
3 „	38.7	38.8	35.4	39.2	40.4	49.8	52.9	54.5	45.8	42.4	41.2	36.7	43.0
4 „	38.4	39.3	35.0	39.4	40.0	49.6	52.1	54.2	46.0	42.0	41.4	37.0	42.9
5 „	38.5	39.1	35.2	39.1	40.2	49.8	52.3	54.2	45.5	41.6	41.4	37.2	42.8
6 „	38.7	39.0	34.7	39.3	40.9	50.5	53.0	54.1	45.6	41.6	41.1	37.0	43.0
7 „	38.9	39.1	34.7	39.6	41.6	51.0	53.5	54.7	46.5	41.4	41.3	36.7	43.2
8 „	39.3	38.9	35.1	40.1	41.8	51.5	53.9	55.0	47.4	42.3	41.5	36.9	43.6
9 „	39.7	39.4	35.4	40.4	42.3	52.1	53.5	55.1	48.3	43.7	41.9	37.0	44.1
10 „	40.4	39.3	35.6	40.1	41.9	52.0	53.7	54.5	48.0	44.2	42.5	37.5	44.1
11 „	40.5	39.0	36.1	40.5	42.2	51.9	53.8	54.2	48.5	44.7	42.9	38.1	44.4
Noon	40.8	39.1	35.9	40.6	42.5	52.0	53.9	53.7	48.6	44.8	43.0	38.3	44.4
1h. p.m.	41.3	38.9	36.0	40.8	42.4	52.1	54.3	53.7	48.2	44.9	42.9	38.2	44.5
2 „	40.9	39.0	36.2	40.8	42.0	52.0	53.9	53.6	48.1	44.7	42.7	38.2	44.3
3 „	40.9	38.8	36.6	40.6	42.3	51.7	53.7	53.7	47.7	44.6	42.7	38.2	44.3
4 „	40.4	38.6	36.8	40.9	41.8	51.8	54.2	53.9	47.3	44.4	42.4	37.9	44.2
5 „	40.1	38.6	36.8	40.7	41.7	51.8	54.1	53.6	47.4	44.3	42.5	37.8	44.1
6 „	40.2	38.5	36.4	40.9	41.8	51.7	54.0	53.7	47.0	44.1	42.6	37.8	44.1
7 „	39.7	38.5	36.7	40.7	42.0	51.6	53.7	53.7	46.8	43.9	42.1	37.7	43.9
8 „	39.4	38.3	36.3	40.3	41.6	51.7	52.7	53.6	46.9	43.9	41.7	37.4	43.7
9 „	38.9	38.3	36.2	40.0	41.6	51.4	53.7	53.5	46.6	43.7	41.7	37.3	43.6
10 „	38.7	38.4	35.9	39.7	41.5	51.1	53.8	53.5	46.5	43.4	41.7	37.1	43.4
11 „	38.6	38.4	35.8	39.7	41.2	50.7	53.6	53.5	46.4	43.2	42.0	36.9	43.3
Means	39.6	38.9	35.8	40.1	41.4	51.1	53.5	54.1	47.0	43.4	42.0	37.4	43.7

MONTHLY MEAN DEGREE of HUMIDITY at every HOUR of the DAY, as deduced by GLAISHER'S TABLES from the corresponding AIR and EVAPORATION TEMPERATURES, for the YEAR 1877.

Hour, Greenwich Mean Solar Time (Civil reckoning).	1877. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly Means.
Midnight	92	87	89	87	85	83	89	87	89	88	89	90	88
1h. a.m.	92	87	89	88	86	84	90	90	90	89	90	89	89
2 „	92	87	90	87	87	84	91	91	91	90	90	90	89
3 „	92	87	92	88	90	86	93	91	92	89	90	89	90
4 „	91	89	91	90	89	86	92	90	93	90	91	90	90
5 „	91	89	92	89	88	85	92	90	91	89	90	91	90
6 „	92	88	91	88	87	83	90	89	92	90	90	91	89
7 „	93	89	90	84	81	75	83	86	90	89	90	90	87
8 „	93	87	87	82	74	68	77	78	84	87	89	91	83
9 „	93	85	82	78	71	63	70	73	78	82	87	90	79
10 „	90	82	77	72	65	58	67	67	71	75	84	87	75
11 „	86	78	72	72	64	55	64	62	71	70	81	86	72
Noon	84	76	70	70	63	52	62	58	68	68	79	83	69
1h. p.m.	84	74	69	69	62	51	62	58	66	67	78	80	68
2 „	82	73	69	67	60	50	59	58	64	66	77	80	67
3 „	83	73	71	67	62	49	59	59	64	68	78	81	68
4 „	84	74	73	72	61	51	61	61	66	70	81	84	70
5 „	85	77	76	73	63	53	63	64	70	74	84	86	72
6 „	87	78	80	78	67	57	67	67	74	79	87	88	76
7 „	87	80	84	81	73	62	71	73	78	81	87	88	79
8 „	87	82	86	83	76	71	73	78	83	83	88	89	82
9 „	88	85	87	84	81	75	82	82	86	85	89	90	84
10 „	90	86	87	85	84	79	84	84	88	86	89	90	86
11 „	90	87	88	87	85	81	86	86	88	86	91	90	87
Means	89	83	83	80	75	68	76	76	80	81	86	88	80

See? LXIV

TOTAL AMOUNT of SUNSHINE registered in each HOUR of the DAY in each MONTH, as derived from the Records of CAMPBELL'S SELF-REGISTERING INSTRUMENT, for the YEAR 1877.

⊙ min

⊙ max

1877. Month.	Registered Duration of Sunshine in the Hour ending 5h. a.m.	6h. a.m.	7h. a.m.	8h. a.m.	9h. a.m.	10h. a.m.	11h. a.m.	Noon.	1h. p.m.	2h. p.m.	3h. p.m.	4h. p.m.	5h. p.m.	6h. p.m.	7h. p.m.	Total registered Duration of Sunshine in each Month.	Corresponding aggregate Period during which the Sun was above Horizon.	Mean Altitude of the Sun at Noon.
	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	h	°
January	..	..	..	..	..	0·7	2·9	4·8	4·7	4·3	1·3	..	..	..	..	18·7	259·1	18
February ...	..	..	..	0·2	1·8	3·9	4·3	4·6	7·5	8·0	5·2	0·9	..	..	..	36·4	277·9	26
March	..	..	1·2	6·0	11·6	12·6	14·0	11·7	12·3	10·6	8·7	6·0	4·4	0·2	..	99·3	366·9	37
April	..	..	3·8	5·8	7·0	9·4	8·7	8·2	6·8	8·7	5·6	3·4	2·9	1·5	..	71·8	414·9	48
May	0·1	6·0	11·2	12·5	11·3	13·4	13·2	12·1	11·1	12·2	11·9	10·9	10·1	7·7	3·4	147·1	482·1	57
June	..	10·2	17·2	20·5	21·9	22·6	21·4	21·0	22·3	20·4	20·8	20·9	18·7	18·5	10·7	267·1	494·5	62
July	..	6·8	15·3	15·9	15·2	15·4	15·0	15·0	13·8	14·4	14·0	12·1	9·9	9·8	4·6	177·2	496·8	60
August	..	0·7	8·6	11·8	14·5	17·3	15·3	17·3	14·8	14·3	14·5	10·0	11·4	7·4	0·7	158·6	449·1	52
September ..	..	..	1·9	5·3	8·7	12·6	12·3	11·8	12·5	13·8	9·7	9·2	6·6	1·2	..	105·6	376·9	41
October	..	..	..	1·1	8·7	13·9	16·8	15·2	14·5	11·9	11·4	5·9	1·7	..	..	101·1	328·7	30
November ..	..	..	..	..	1·1	9·4	10·3	9·5	9·2	8·9	7·0	1·2	..	..	..	56·6	264·4	20
December ..	..	..	..	..	..	1·1	6·0	6·0	7·3	5·7	0·9	..	..	..	..	27·0	242·7	16

The hours are reckoned from apparent noon.

The total registered duration of sunshine during the year was 1269·5 hours; the corresponding aggregate period during which the Sun was above the horizon was 4454·0 hours; the mean proportion for the year (constant sunshine = 1) was therefore 0·284.

(I.)—Reading of a Thermometer whose bulb is sunk to the depth of 25·6 feet (24 French feet) below the surface of the soil, at Noon on every Day of the Year 1877.

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	52·68	52·10	51·46	50·83	50·19	49·91	49·98	50·62	51·53	52·40	52·96	52·98
2	52·66	52·08	51·47	50·82	50·18	49·92	50·02	50·62	51·55	52·42	52·95	53·00
3	52·65	52·06	51·46	50·79	50·17	49·95	50·07	50·65	51·61	52·42	52·96	52·98
4	52·65	52·04	51·42	50·78	50·14	49·95	50·08	50·71	51·62	52·45	52·96	52·96
5	52·63	52·02	51·39	50·74	50·14	49·93	50·06	50·72	51·64	52·50	52·97	52·90
6	52·61	52·00	51·36	50·74	50·13	49·94	50·05	50·77	51·67	52·53	53·00	52·92
7	52·60	52·00	51·34	50·72	50·13	49·94	50·10	50·80	51·71	52·52	53·00	52·91
8	52·59	51·96	51·30	50·68	50·13	49·93	50·18	50·82	51·74	52·55	53·00	52·95
9	52·57	51·93	51·29	50·66	50·12	49·94	50·20	50·84	51·77	52·57	53·00	52·95
10	52·55	51·94	51·27	50·64	50·10	49·90	50·17	50·89	51·80	52·60	53·01	52·90
11	52·50	51·90	51·25	50·58	50·05	49·88	50·18	50·91	51·84	52·66	53·02	52·88
12	52·47	51·88	51·23	50·57	50·07	49·92	50·16	50·91	51·88	52·63	53·02	52·92
13	52·46	51·86	51·22	50·55	50·07	49·94	50·18	50·97	51·92	52·67	53·03	52·90
14	52·48	51·83	51·22	50·53	50·05	49·94	50·19	51·00	51·93	52·73	53·03	52·85
15	52·43	51·82	51·18	50·49	50·04	49·94	50·21	51·04	51·96	52·72	53·03	52·86
16	52·43	51·79	51·16	50·45	50·04	49·94	50·23	51·07	51·98	52·72	53·05	52·87
17	52·42	51·76	51·13	50·42	50·03	49·93	50·22	51·10	52·04	52·74	53·00	52·86
18	52·38	51·75	51·13	50·40	50·04	49·95	50·28	51·16	52·10	52·74	53·02	52·80
19	52·39	51·72	51·09	50·39	50·00	49·96	50·28	51·17	52·07	52·78	53·00	52·80
20	52·34	51·68	51·06	50·38	50·00	49·94	50·30	51·20	52·08	52·82	53·00	52·80
21	52·33	51·65	51·06	50·36	50·01	49·94	50·32	51·23	52·12	52·81	53·02	52·80
22	52·29	51·64	51·00	50·35	49·98	49·95	50·35	51·25	52·20	52·85	53·03	52·80
23	52·28	51·63	51·02	50·37	49·97	49·96	50·38	51·28	52·16	52·85	53·00	52·78
24	52·26	51·61	50·98	50·32	49·97	49·95	50·41	51·30	52·20	52·84	53·00	52·76
25	52·23	51·58	50·97	50·28	49·97	49·95	50·43	51·33	52·21	52·85	52·98	52·72
26	52·20	51·54	50·94	50·27	49·97	49·95	50·45	51·36	52·22	52·87	52·99	52·73
27	52·19	51·50	50·94	50·26	49·96	49·96	50·50	51·39	52·28	52·90	53·01	52·70
28	52·20	51·48	50·93	50·23	49·95	49·96	50·52	51·42	52·32	52·90	53·00	52·70
29	52·14		50·92	50·20	49·94	50·02	50·56	51·45	52·35	52·92	52·98	52·72
30	52·11		50·88	50·22	49·95	50·00	50·56	51·47	52·35	52·93	52·98	52·71
31	52·10		50·87		49·96		50·60	51·51		52·95		52·65
Means.	52·41	51·81	51·16	50·50	50·05	49·94	50·27	51·06	51·96	52·70	53·00	52·84

(II.)—Reading of a Thermometer whose bulb is sunk to the depth of 12·8 feet (12 French feet) below the surface of the soil, at Noon on every Day of the Year 1877.

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	51·34	49·91	48·92	47·70	48·15	49·16	52·02	54·69	56·45	56·63	55·04	53·22
2	51·25	49·88	48·90	47·76	48·20	49·21	52·12	54·72	56·55	56·56	54·95	53·18
3	51·21	49·80	48·93	47·74	48·20	49·30	52·27	54·80	56·50	56·50	54·88	53·08
4	51·11	49·75	48·86	47·71	48·22	49·35	52·38	54·89	56·57	56·48	54·84	52·98
5	51·01	49·68	48·88	47·66	48·24	49·38	52·50	55·00	56·61	56·48	54·79	52·90
6	50·95	49·61	48·80	47·66	48·28	49·44	52·60	55·07	56·64	56·43	54·77	52·86
7	50·90	49·61	48·74	47·65	48·32	49·52	52·70	55·09	56·68	56·34	54·70	52·74
8	50·82	49·53	48·67	47·65	48·34	49·58	52·80	55·16	56·69	56·30	54·60	52·66
9	50·64	49·45	48·71	47·60	48·35	49·67	52·93	55·23	56·74	56·26	54·56	52·58
10	50·57	49·45	48·60	47·57	48·37	49·70	53·08	55·28	56·75	56·21	54·51	52·46
11	50·48	49·38	48·55	47·56	48·37	49·80	53·17	55·34	56·80	56·18	54·45	52·32
12	50·41	49·34	48·54	47·58	48·36	49·84	53·24	55·40	56·81	56·10	54·40	52·27

(II.)—Reading of a Thermometer whose bulb is sunk to the depth of 12·8 feet (12 French feet) below the surface of the soil, at Noon on every Day of the Year 1877—*concluded.*

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
13	50·45	49·30	48·50	47·64	48·39	49·92	53·35	55·49	56·80	56·09	54·30	52·22
14	50·50	49·26	48·48	47·67	48·40	50·02	53·41	55·58	56·82	56·01	54·28	52·11
15	50·45	49·22	48·42	47·70	48·40	50·12	53·49	55·63	56·78	55·98	54·26	52·09
16	50·46	49·20	48·38	47·70	48·44	50·22	53·53	55·70	56·78	55·88	54·22	52·07
17	50·46	49·15	48·32	47·73	48·46	50·32	53·60	55·74	56·76	55·84	54·15	51·95
18	50·44	49·15	48·28	47·78	48·53	50·43	53·72	55·80	56·78	55·77	54·09	51·88
19	50·39	49·12	48·22	47·83	48·55	50·56	53·81	55·87	56·77	55·74	54·00	51·76
20	50·36	49·10	48·17	47·88	48·55	50·63	53·90	55·95	56·75	55·74	53·96	51·70
21	50·34	49·06	48·11	47·93	48·56	50·75	53·98	55·96	56·72	55·66	53·90	51·64
22	50·30	49·04	48·08	47·98	48·61	50·85	54·00	55·96	56·72	55·64	53·90	51·59
23	50·30	49·04	48·07	48·00	48·70	50·95	54·11	56·00	56·70	55·52	53·80	51·52
24	50·23	49·04	48·03	48·03	48·78	51·08	54·18	56·07	56·70	55·47	53·74	51·41
25	50·21	49·02	48·00	48·04	48·85	51·20	54·23	56·08	56·66	55·40	53·67	51·28
26	50·15	49·00	47·98	48·05	48·88	51·33	54·30	56·17	56·70	55·34	53·62	51·22
27	50·11	48·96	47·95	48·08	48·94	51·48	54·40	56·24	56·67	55·29	53·60	51·12
28	50·07	48·94	47·92	48·10	48·97	51·61	54·45	56·29	56·68	55·20	53·50	51·03
29	50·03		47·92	48·10	49·02	51·80	54·53	56·35	56·68	55·19	53·40	50·97
30	50·00		47·85	48·13	49·10	51·90	54·60	56·39	56·62	55·12	53·33	50·88
31	49·95		47·81		49·13		54·70	56·42		55·08		50·82
Means.	50·51	49·32	48·37	47·81	48·54	50·30	53·49	55·62	56·69	55·88	54·21	52·02

(III.)—Reading of a Thermometer whose bulb is sunk to the depth of 6·4 feet (6 French feet) below the surface of the soil, at Noon on every Day of the Year 1877.

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	48·49	47·49	47·40	46·33	48·62	51·38	57·90	59·64	60·90	57·78	54·34	50·82
2	48·62	47·40	47·30	46·52	48·65	51·54	58·00	59·78	60·85	57·60	54·30	50·64
3	48·71	47·30	47·15	46·64	48·69	51·68	58·17	59·98	60·77	57·50	54·24	50·51
4	48·69	47·31	47·04	46·78	48·68	51·78	58·25	60·13	60·72	57·39	54·20	50·44
5	48·69	47·32	46·91	46·89	48·70	51·89	58·30	60·30	60·66	57·31	54·11	50·34
6	48·80	47·31	46·84	47·08	48·67	52·06	58·32	60·33	60·51	57·20	54·04	50·30
7	48·80	47·32	46·77	47·26	48·62	52·34	58·40	60·30	60·38	56·96	53·90	50·19
8	48·77	47·32	46·72	47·38	48·58	52·61	58·47	60·32	60·22	56·85	53·80	50·10
9	48·73	47·36	46·68	47·55	48·59	52·85	58·50	60·37	60·14	56·71	53·75	50·08
10	48·68	47·45	46·60	47·66	48·67	53·00	58·58	60·39	60·03	56·60	53·77	50·00
11	48·52	47·56	46·48	47·76	48·80	53·28	58·52	60·38	59·97	56·48	53·72	49·90
12	48·63	47·60	46·42	47·90	48·95	53·52	58·52	60·39	59·86	56·31	53·60	49·88
13	48·72	47·70	46·34	48·02	49·19	53·78	58·58	60·40	59·78	56·26	53·50	49·70
14	48·80	47·78	46·28	48·10	49·38	54·15	58·61	60·42	59·74	56·18	53·50	49·52
15	48·59	47·80	46·18	48·18	49·53	54·48	58·70	60·41	59·66	56·02	53·46	49·46
16	48·50	47·90	46·20	48·21	49·68	54·76	58·78	60·45	59·58	55·90	53·36	49·32
17	48·41	47·98	46·22	48·29	49·80	55·02	58·90	60·50	59·58	55·88	53·18	49·12
18	48·38	48·06	46·28	48·36	49·98	55·30	59·00	60·60	59·55	55·82	53·09	49·00
19	48·39	48·08	46·30	48·39	50·10	55·58	59·07	60·70	59·50	55·78	53·00	48·86
20	48·35	48·03	46·29	48·38	50·18	55·81	59·05	60·80	59·38	55·65	52·84	48·78
21	48·42	48·03	46·25	48·37	50·32	56·09	59·10	60·82	59·31	55·42	52·70	48·74
22	48·48	48·00	46·20	48·30	50·40	56·38	59·08	60·95	59·26	55·30	52·57	48·62
23	48·50	47·92	46·18	48·30	50·48	56·64	59·15	60·98	59·10	55·16	52·34	48·50
24	48·42	47·84	46·11	48·33	50·57	56·91	59·18	61·05	58·96	54·98	52·10	48·50
25	48·36	47·68	46·02	48·39	50·61	57·12	59·21	61·06	58·72	54·86	51·85	48·40
26	48·20	47·58	45·94	48·47	50·64	57·28	59·29	61·12	58·60	54·70	51·76	48·43

(III.)—Reading of a Thermometer whose bulb is sunk to the depth of 6·4 feet (6 French feet) below the surface of the soil, at Noon on every Day of the Year 1877—*concluded.*

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
27	48·05	47·50	45·96	48·51	50·66	57·45	59·38	61·13	58·40	54·66	51·61	48·30
28	47·96	47·47	46·00	48·55	50·73	57·60	59·40	61·08	58·23	54·60	51·32	48·20
29	47·79		46·09	48·55	50·83	57·73	59·46	61·02	58·08	54·58	51·12	48·10
30	47·65		46·10	48·61	51·01	57·80	59·55	60·98	57·95	54·50	50·94	47·89
31	47·55		46·22		51·20		59·65	60·93		54·42		47·65
Means.	48·44	47·65	46·43	47·87	49·66	54·59	58·81	60·57	59·61	55·98	53·07	49·30

(IV.)—Reading of a Thermometer whose bulb is sunk to the depth of 3·2 feet (3 French feet) below the surface of the soil, at Noon on every Day of the Year 1877.

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	46·33	43·54	43·40	45·25	47·58	52·96	62·45	63·86	62·48	55·98	52·50	46·60
2	46·63	43·73	42·89	45·48	47·58	53·12	62·52	64·20	62·22	55·90	52·29	46·30
3	46·50	44·13	42·80	45·77	47·51	53·31	62·22	64·08	61·62	55·80	51·92	46·20
4	46·42	44·30	43·31	46·18	47·13	53·62	62·00	63·60	61·21	55·51	51·80	46·28
5	46·41	44·24	43·70	46·72	46·90	54·59	62·02	63·40	60·80	55·28	51·34	46·40
6	46·51	44·10	43·71	46·93	46·68	55·46	62·05	63·38	60·58	55·00	51·39	46·52
7	46·42	44·43	43·53	46·94	46·87	55·85	61·82	63·42	60·40	54·75	51·55	46·56
8	46·51	44·93	43·26	46·92	47·39	55·75	61·52	63·40	60·32	54·60	51·90	46·52
9	46·70	45·32	43·00	47·17	47·99	56·07	61·13	63·08	60·12	54·51	51·98	46·35
10	46·80	45·50	42·65	47·51	48·90	56·70	61·02	62·86	60·00	54·26	51·98	46·20
11	46·30	45·70	42·50	47·79	49·48	57·62	61·22	62·75	60·06	54·02	51·90	45·72
12	46·03	45·98	42·40	47·82	50·10	58·50	61·78	62·58	60·10	53·92	51·40	45·38
13	45·40	46·12	42·40	47·70	50·20	58·93	62·11	62·55	60·14	53·91	51·10	45·30
14	45·00	46·18	42·70	47·68	50·30	59·25	62·30	62·75	60·15	54·08	50·80	45·10
15	44·70	46·33	43·16	47·83	50·38	59·35	62·48	63·06	60·18	54·36	50·30	44·71
16	44·76	46·48	43·51	47·82	50·59	59·75	62·31	63·38	60·18	54·57	50·30	44·30
17	44·82	46·43	44·08	47·80	50·73	60·22	62·05	63·70	60·00	54·25	50·50	44·32
18	45·29	46·21	43·69	47·42	50·92	60·80	61·71	63·86	59·72	53·48	50·19	44·66
19	45·59	46·00	43·38	46·93	50·98	61·42	61·52	63·90	59·50	52·86	49·30	44·62
20	45·99	45·90	43·22	46·74	51·04	61·79	61·62	64·17	59·30	52·40	49·35	44·20
21	46·16	45·52	43·05	46·80	51·00	62·23	61·80	64·40	59·05	52·28	48·88	44·30
22	45·71	45·04	42·80	47·03	50·91	62·49	61·90	64·60	58·40	52·48	48·47	44·36
23	45·24	44·69	42·53	47·37	50·81	62·54	62·10	64·29	57·72	52·68	48·50	44·50
24	44·61	44·42	42·15	47·68	50·70	62·45	62·17	63·92	57·35	52·66	48·36	44·83
25	44·40	44·35	42·50	47·74	50·68	62·12	62·19	63·48	56·98	52·30	47·60	44·52
26	44·20	44·52	43·08	47·71	50·83	61·92	62·18	63·09	56·56	52·25	47·27	44·18
27	43·95	44·58	43·56	47·62	51·32	61·80	62·25	62·90	56·29	52·36	46·90	43·64
28	43·66	44·11	43·92	47·53	51·85	61·80	62·23	62·86	56·15	52·20	46·90	43·12
29	43·57		44·25	47·60	52·35	61·93	62·44	62·92	56·04	52·20	47·00	42·64
30	43·51		44·68	47·55	52·57	62·30	62·65	63·02	55·99	52·20	46·87	42·73
31	43·66		45·04		52·76		63·40	62·90		52·38		43·20
Means.	45·41	45·10	43·25	47·17	49·84	58·89	62·04	63·43	59·32	53·72	50·02	44·98

(V.)—Reading of a Thermometer whose bulb is sunk to the depth of 1 inch below the surface of the soil, at Noon on every Day of the Year 1877.

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	47·2	43·5	35·0	47·0	46·0	55·4	62·6	67·0	58·0	53·2	49·6	46·0
2	43·8	45·2	40·0	46·6	46·2	54·6	62·8	63·8	59·0	52·0	48·3	42·2
3	45·0	42·8	44·0	48·2	46·0	59·4	62·9	62·0	58·4	50·0	49·0	44·0
4	47·0	43·0	43·8	50·8	42·3	61·5	63·0	62·0	56·3	50·0	46·5	44·1
5	46·3	41·7	41·7	47·8	44·5	61·3	63·0	64·6	56·3	50·9	50·0	44·0
6	45·3	45·2	40·0	47·6	45·1	58·9	61·0	66·0	57·0	51·0	52·0	44·6
7	47·0	48·0	39·5	47·2	47·5	57·2	60·0	66·2	58·0	49·1	53·0	44·1
8	46·0	46·4	38·7	48·8	49·8	60·0	59·0	63·1	57·2	52·0	50·5	42·2
9	47·0	45·0	38·0	47·8	53·3	62·3	60·8	62·7	58·2	50·0	48·0	43·5
10	45·0	47·5	38·0	49·4	54·8	63·2	63·5	62·4	59·5	49·0	51·0	40·3
11	43·0	47·4	37·4	49·0	53·8	65·5	65·5	61·9	60·8	51·3	50·0	38·0
12	40·0	47·0	40·0	46·5	56·9	66·0	64·8	62·1	60·0	51·0	47·8	44·0
13	39·4	46·8	42·0	47·8	52·5	61·9	64·8	64·0	60·0	53·7	47·0	41·0
14	43·0	47·0	44·5	48·5	51·8	61·2	66·0	66·0	61·4	56·0	44·6	39·0
15	41·3	47·3	43·9	47·8	52·2	63·2	64·0	65·4	60·8	55·0	48·2	38·0
16	43·5	45·6	43·5	47·2	53·0	64·2	62·0	66·5	56·5	50·6	51·7	42·0
17	45·8	44·1	41·6	45·3	52·4	65·3	61·2	66·5	56·4	47·0	44·0	43·5
18	44·8	44·8	40·5	43·7	53·8	66·8	60·7	66·0	56·6	45·2	45·3	42·2
19	49·0	44·0	40·0	44·0	52·7	68·2	63·7	68·0	58·0	46·0	45·0	38·0
20	45·9	42·0	39·8	45·0	50·4	66·8	62·2	68·8	56·0	49·5	43·3	40·4
21	41·1	41·0	38·2	47·0	51·4	66·2	62·0	62·5	52·3	51·0	42·2	41·5
22	40·8	40·3	37·0	48·5	50·3	65·3	64·0	65·3	51·4	53·4	46·8	43·3
23	39·0	40·0	38·1	48·0	49·2	62·5	65·0	61·3	53·0	50·4	45·0	43·0
24	41·9	42·0	40·8	47·0	50·6	61·0	63·0	59·9	53·0	48·0	43·0	42·0
25	42·9	44·5	44·0	47·0	51·0	62·0	63·0	61·1	49·8	51·0	42·0	38·0
26	39·3	42·3	44·0	46·3	54·6	63·5	63·0	62·8	52·1	50·2	41·0	38·0
27	39·5	39·5	44·8	46·8	54·8	62·8	64·0	64·0	50·9	51·0	46·0	36·0
28	42·0	36·6	45·0	46·9	56·0	63·0	63·5	63·4	52·2	50·0	43·9	35·4
29	39·9		46·0	47·0	54·5	66·3	67·0	64·0	52·2	51·0	44·3	42·0
30	43·0		46·8	46·4	55·0	67·2	67·0	63·0	53·0	51·4	43·0	44·6
31	39·9		45·8		56·7		69·2	61·2		52·0		42·0
Means.	43·4	43·9	41·4	47·2	51·3	62·8	63·4	64·0	56·1	50·7	46·7	41·5

(VI.)—Reading of a Thermometer within the case covering the deep-sunk Thermometers, whose bulb is placed on a level with their scales, at Noon on every Day of the Year 1877.

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
1	49·9	48·8	33·0	49·8	45·7	55·2	61·8	68·2	60·5	60·8	53·6	44·0
2	40·4	49·2	48·8	53·5	48·4	56·6	68·8	64·2	66·2	55·5	51·5	45·3
3	48·6	44·9	51·0	54·0	49·7	75·8	69·8	66·0	58·3	55·5	52·0	45·5
4	49·9	44·3	44·8	60·0	46·4	72·8	69·5	65·8	60·2	54·5	52·3	44·2
5	51·1	45·9	41·8	49·2	50·0	66·6	69·5	75·0	62·1	61·0	57·2	42·8
6	48·6	50·7	39·5	52·0	52·2	60·6	64·0	73·4	64·5	61·0	56·9	49·0
7	51·0	56·2	39·5	54·1	57·8	63·0	63·0	69·4	63·2	48·0	53·5	46·3
8	50·0	47·7	37·7	55·0	61·2	69·8	62·8	66·6	61·0	54·0	54·0	44·2
9	50·4	47·8	40·5	53·3	62·4	73·3	67·0	67·4	63·8	53·3	54·8	47·0
10	42·4	52·5	37·5	51·6	62·2	74·0	74·7	65·3	63·2	51·5	52·3	37·4
11	38·0	51·6	40·5	49·8	51·6	75·7	72·8	66·2	68·3	54·5	51·5	36·0
12	30·6	49·3	45·8	47·5	55·5	75·4	73·3	67·1	67·3	53·8	49·2	48·4
13	38·9	50·0	46·5	55·8	54·3	61·8	73·5	68·8	65·2	60·1	47·0	43·8
14	47·5	50·2	51·5	52·2	55·8	67·4	67·6	73·0	66·0	67·8	47·3	38·6
15	40·9	50·0	48·8	52·1	56·0	71·8	66·0	71·8	62·0	56·4	52·3	39·8

(VI.)—Reading of a Thermometer within the case covering the deep-sunk Thermometers, whose bulb is placed on a level with their scales at Noon on every Day of the Year 1877—*concluded.*

Days of the Month, 1877.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
d	°	°	°	°	°	°	°	°	°	°	°	°
16	48·6	46·0	46·1	47·8	55·4	73·7	60·2	74·0	55·5	49·2	56·3	45·9
17	50·9	45·7	44·8	44·8	52·6	75·6	63·0	73·1	57·3	51·5	46·2	45·2
18	47·8	47·4	47·5	41·9	61·2	79·5	64·5	74·2	58·8	49·8	48·7	42·0
19	53·5	43·8	45·3	46·9	53·0	80·8	69·7	76·5	60·8	52·3	48·5	35·2
20	44·9	40·0	39·3	52·6	51·4	74·3	67·0	80·2	56·0	60·8	43·0	43·0
21	44·2	40·6	39·9	47·8	55·4	73·1	69·8	73·0	55·5	55·8	42·8	43·0
22	41·9	39·8	38·9	54·5	50·7	70·8	66·8	68·4	55·8	60·2	50·3	46·0
23	43·5	42·0	45·2	54·0	49·4	61·9	69·5	64·7	53·3	52·0	48·2	43·0
24	45·8	47·6	48·3	52·7	54·8	64·0	67·9	65·2	57·0	52·8	43·5	44·2
25	49·8	49·9	51·8	51·8	58·2	69·0	66·8	61·0	49·8	54·0	41·0	36·3
26	38·6	39·0	46·8	48·2	63·8	69·0	63·8	66·8	54·6	50·4	44·3	38·4
27	43·8	37·8	51·5	49·2	62·8	68·2	71·5	69·2	53·8	56·2	51·3	34·3
28	48·0	36·8	52·5	48·0	59·8	72·0	68·0	68·6	57·7	55·2	41·3	34·7
29	43·2		53·0	50·8	59·1	79·3	77·2	68·0	58·0	54·2	44·1	52·0
30	42·8		51·7	47·9	62·3	76·6	75·6	67·2	60·8	56·2	44·0	50·8
31	41·2		51·2		62·6		82·5	65·3		55·5		43·0
Means .	45·4	46·3	45·2	51·0	55·5	70·3	68·6	69·1	59·9	55·3	49·3	42·9

ABSTRACT of the CHANGES of the DIRECTION of the WIND, as derived from OSLER'S ANEMOMETER.

1877. Month.	Direction of the Wind. At beginning of Month.	Direction of the Wind. At end of Month.	Apparent Motion.	Times of Shifts of the Recording Pencil.	Amount of Motion.	Monthly Excess of Motion. Direct.	Monthly Excess of Motion. Retrograde.
			°	d h m	°	°	°
January . .	S.S.W.	S.S.W.	0	3. 22. 0	+ 360		
				10. 22. 0	− 360		
				12. 21. 0	+ 720	1800	
				19. 22. 0	+ 360		
				20. 9. 30	+ 360		
				22. 8. 45	+ 360		
February .	S.S.W.	N.N.W.	+ 135	13. 8. 20	+ 360	495	
March . . .	N.N.W.	W.S.W.	− 90	9. 9. 30	+ 360		
				10. 1. 45	+ 360		
				22. 8. 30	+ 360		
				23. 21. 0	− 720	630	
				25. 22. 0	− 360		
				26. 2. 30	+ 360		
				30. 22. 0	+ 360		
April	W.S.W.	N.	+ 112½	8. 8. 15	− 360		
				8. 21. 0	+ 360		
				9. 21. 0	− 360		
				11. 0. 30	+ 360		
				12. 2. 50	− 360		
				12. 21. 15	+ 360		
				13. 9. 10	+ 360		
				14. 0. 15	− 360		
				15. 8. 30	− 360		2407½
				16. 22. 0	− 360		
				18. 2. 45	− 360		
				19. 2. 45	− 360		
				24. 22. 0	+ 360		
				25. 0. 15	− 360		
				26. 0. 10	− 360		
				26. 22. 0	− 360		
				27. 21. 0	− 360		
May	N.	S.S.E.	− 202½	1. 21. 15	+ 360		
				5. 10. 45	− 360		
				7. 0. 0	− 360		
				7. 2. 45	− 360		
				8. 9. 30	− 360		
				9. 0. 15	+ 360		
				10. 21. 15	− 360		
				11. 7. 0	+ 360	517½	
				11. 9. 30	+ 720		
				11. 21. 0	− 360		
				12. 22. 0	+ 360		
				16. 2. 45	− 360		
				23. 22. 0	+ 360		
				25. 7. 30	+ 360		
				26. 0. 30	+ 360		
June	S.S.E.	S.E.	− 22½	3. 21. 0	− 360		
				4. 0. 15	+ 360		
				6. 0. 0	+ 360		
June—*cont.*				7. 22. 0	− 360		
				8. 2. 45	+ 360		
				11. 21. 0	− 720		742½
				11. 22. 0	− 720		
				12. 0. 20	+ 360		
				13. 21. 15	− 360		
				16. 8. 0	+ 360		
				21. 22. 0	+ 360		
				25. 2. 45	− 360		
July	S.E.	N.W.	+ 180	5. 8. 0	+ 360		
				6. 8. 45	− 360		
				7. 1. 45	+ 360		
				12. 0. 15	+ 360	540	
				12. 2. 45	− 360		
				12. 8. 45	− 360		
				29. 8. 0	+ 360		
August . . .	N.W.	W.	− 45	4. 22. 0	+ 360		
				14. 22. 0	+ 360		
				15. 0. 25	− 360	1395	
				18. 22. 0	+ 360		
				24. 3. 0	+ 360		
				25. 22. 0	+ 360		
September	W.	N.N.E.	+ 112½	4. 21. 0	+ 360		
				6. 8. 30	+ 360		
				6. 22. 0	− 360		
				7. 0. 30	+ 360		
				7. 9. 20	− 360		
				11. 8. 30	+ 360	112½	
				17. 22. 0	− 360		
				21. 21. 15	− 360		
				26. 21. 0	+ 720		
				28. 2. 45	− 360		
				30. 7. 30	− 360		
October . .	N.N.E.	W.S.W.	− 135	5. 0. 0	+ 360		
				6. 0. 15	− 720		
				9. 22. 0	+ 360		135
				19. 22. 0	+ 360		
				25. 2. 50	− 360		
November	W.S.W.	S.S.W.	− 45	17. 1. 40	+ 360		
				17. 8. 15	− 360		
				17. 22. 0	+ 360		405
				23. 22. 0	− 360		
				27. 8. 20	− 360		
December	S.S.W.	W.S.W.	+ 45	6. 2. 45	+ 360		
				9. 22. 0	− 360		
				10. 21. 0	+ 360	1125	
				18. 22. 0	+ 360		
				20. 22. 0	+ 360		

The whole excess of direct motion for the year was 2925°.

The sign + implies that the change in the direction of the wind has taken place in the order N., E., S., W., N., &c., or in *direct* motion; the sign − implies that the change has taken place in the order N., W., S., E., N., &c., or in *retrograde* motion.
The times of shifts of the recording pencil, as given above, refer to the shifts made by hand, when, by the turning of the vane, the trace tends to travel or has travelled out of range.

The revolution-counter which is attached to the vertical spindle of the vane, whose readings increase with change of direction of the wind in *direct* motion, and decrease with change of direction in *retrograde* motion, gave the following readings:—

	revs.
On 1876, December 31st. 12h	43·0
On 1877, December 31st. 12h	51·1

Implying an excess of direct motion, during the year, of 8·1 revolutions, or 2916°.

MEAN HOURLY MEASURES of the HORIZONTAL MOVEMENT of the AIR in each Month, and GREATEST and LEAST HOURLY MEASURES, as derived from the Records of ROBINSON'S ANEMOMETER.

Hour ending	1877.												Mean for the Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
h	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
1 a.m.	14·1	15·6	11·6	11·8	9·4	8·7	10·1	9·5	9·0	11·3	15·5	12·6	11·6
2 a.m.	14·1	15·6	11·2	11·7	9·2	9·2	9·7	9·0	8·2	11·8	15·5	12·4	11·4
3 a.m.	14·5	14·5	11·4	10·9	8·6	8·9	9·3	9·4	8·0	11·4	14·9	11·9	11·1
4 a.m.	14·5	14·7	11·1	11·3	9·3	9·0	9·7	9·7	8·5	11·1	14·9	12·4	11·4
5 a.m.	14·0	14·9	11·7	10·4	8·9	9·7	9·8	9·6	8·1	11·3	15·5	12·7	11·4
6 a.m.	14·2	15·3	11·4	10·9	9·3	9·8	9·6	9·8	8·6	11·0	15·3	12·1	11·4
7 a.m.	14·7	15·7	11·9	10·9	9·4	10·6	10·2	10·1	7·9	10·5	14·4	12·8	11·6
8 a.m.	14·7	16·9	12·5	12·1	10·6	11·6	11·5	11·1	8·6	10·7	14·5	12·7	12·3
9 a.m.	14·9	18·2	13·4	13·0	12·3	12·3	12·6	12·7	9·4	11·1	15·1	12·7	13·1
10 a.m.	14·5	18·7	14·3	14·3	13·2	13·9	13·3	14·0	10·7	13·5	16·9	12·9	14·2
11 a.m.	15·8	19·2	14·7	14·5	13·7	14·0	13·3	15·4	11·6	14·3	17·0	13·1	14·7
Noon.	17·5	19·7	15·1	14·3	13·8	14·0	14·1	15·4	12·2	14·7	16·1	13·2	15·0
1 p.m.	18·6	21·3	16·3	14·7	15·1	14·5	14·2	15·5	12·7	15·6	16·9	14·5	15·8
2 p.m.	17·0	20·4	15·8	15·2	14·5	14·0	14·3	16·1	12·4	15·5	17·4	13·7	15·5
3 p.m.	16·6	19·9	15·1	14·9	15·4	14·3	15·3	16·0	12·8	15·5	16·2	13·1	15·4
4 p.m.	16·5	19·3	15·2	14·9	14·4	14·8	15·0	15·6	12·3	14·2	15·8	12·1	15·0
5 p.m.	15·6	18·1	12·9	14·5	13·6	14·5	14·5	15·5	11·2	13·4	15·0	11·9	14·2
6 p.m.	15·9	16·9	11·5	13·6	13·4	14·5	14·2	14·4	11·0	12·7	14·5	11·9	13·7
7 p.m.	15·9	16·7	11·5	12·3	12·1	13·2	12·7	13·1	10·4	12·2	15·4	11·9	13·1
8 p.m.	15·9	15·8	11·0	12·7	11·6	12·5	11·6	11·2	10·2	13·2	16·2	12·1	12·8
9 p.m.	16·1	15·0	11·7	12·4	11·2	11·1	11·2	10·1	9·8	12·0	15·8	11·9	12·4
10 p.m.	14·8	15·1	11·9	12·4	10·4	9·6	10·1	10·5	9·1	11·7	15·8	12·0	11·9
11 p.m.	15·4	15·1	11·9	12·1	10·1	9·6	9·8	10·0	8·9	11·4	16·5	12·1	11·9
Midnight.	14·3	15·0	11·9	11·9	9·8	9·2	9·9	9·7	9·0	10·9	16·5	11·7	11·6
Means	15·4	17·0	12·8	12·8	11·6	11·8	11·9	12·2	10·0	12·5	15·7	12·5	13·0
Greatest Hourly Measures	55	42	33	42	38	41	26	35	31	44	47	37	..
Least Hourly Measures	0	2	0	1	0	0	1	1	0	0	0	0	..

AMOUNT OF RAIN COLLECTED IN EACH MONTH OF THE YEAR 1877.

1877, MONTH.	Number of Rainy Days.	Monthly Amount of Rain collected in each Gauge.								
		Self-registering Gauge of Osler's Anemometer.	Second Gauge at Osler's Anemometer.	On the Roof of the Octagon Room.	On the Roof of the Library.	On the Roof of the Photographic Thermometer Shed.	Crosley's.	Gauge partly sunk in the Ground read daily.	Gauge partly sunk in the Ground read Monthly.	On the "Royalist" Police Ship.
		in.	in.	in.	in.	in.	in.	in.	in.	in.
January......	23	2·659	2·858	3·237	3·877	4·120	4·720	4·347	4·36	3·443
February.....	18	0·672	0·739	1·245	1·340	1·607	1·800	1·710	1·67	1·370
March	17	1·448	1·592	1·848	2·133	2·152	2·440	2·230	2·32	1·915
April........	20	2·482	2·570	2·797	3·126	3·194	3·620	3·349	3·28	2·316
May..........	10	0·757	0·870	1·066	1·261	1·253	1·535	1·376	1·31	1·190
June.........	7	0·496	0·535	0·563	0·555	0·642	0·760	0·683	0·52	0·460
July.........	15	1·773	1·816	2·117	2·161	2·445	3·220	2·457	2·45	2·198
August	17	2·214	2·344	2·578	2·792	2·886	3·340	2·905	2·90	2·475
September....	11	0·672	0·790	0·952	1·177	1·120	1·365	1·145	1·08	0·690
October......	13	1·160	1·196	1·492	1·610	1·702	2·205	1·781	1·83	1·412
November....	18	1·891	1·884	2·443	2·636	3·287	4·250	3·529	3·51	2·441
December	17	1·196	1·258	1·509	1·601	1·724	1·975	1·764	1·90	1·497
Sums	186	17·420	18·452	21·847	24·269	26·132	31·230	27·276	27·13	21·407

The heights of the receiving surfaces are as follows:

	Above the Mean Level of the Sea. Ft. In.		Above the Ground. Ft. In.	
The Two Gauges at Osler's Anemometer	205	6	50	8
Gauge on the Roof of the Octagon Room	193	2	38	4
Gauge on the Roof of the Library	177	2	22	4
Gauge on the Roof of the Photographic Thermometer Shed.......	164	10	10	0
Crosley's Gauge	156	6	1	8
The Two Gauges partly sunk in the Ground	155	3	0	5
	Above Level of River.		Above Deck. Ft. In.	
Gauge on the "Royalist" Police Ship, moored in Blackwall Reach.	17	0	8	8

In the month of August the "gauge partly sunk in the ground, read monthly" was found to be leaky; the value adopted is that given by the adjacent similar gauge, read daily.

ROYAL OBSERVATORY, GREENWICH.

OBSERVATIONS

OF

LUMINOUS METEORS.

1877.

Month and Day. 1877.		Greenwich Mean Solar Time.	Observer.	Apparent Size of Meteor in Star-Magnitudes.	Colour of Meteor.	Duration of Meteor in Seconds of Time.	Appearance and Duration of Train.	Length of Meteor's Path in Degrees.	No. for Reference.
		h. m. s.						°	
February	1	8. 39. 17	P., H.	2	Bluish-white	1·8	None	18	1
February	8	8. 16. 30	J.	< 1	Red	1	None	20	2
February	26	6. 18. 0	G.	Jupiter × 2	Blue	8	Broad flaming tail	15	3
March	14	9. 6. 0	N.	2	Bluish-white	0·4	None	5	4
April	24	10. 20. 0	G.	1	Bluish-white	0·6	Slight	7	5
July	20	11. 22.	E.	Jupiter	White	0·3	None	10	6
August	5	10. 25. 45 ±	M.	> 1	Bluish-white	1·0	Train: 8^s or 10^s	..	7
August	7	11. 39. 15	N.	1	White	0·5	Train	..	8
	,,	11. 39. 20	N.	> 1	Bluish-white	0·8	Train	..	9
	,,	11. 41. 30	N.	> 1	Bluish-white	1	Fine train	..	10
	,,	12. 14. 35	N.	2	Bluish-white	0·7	Train	10	11
	,,	12. 16. 43	N.	3	Bluish-white	0·4	None	5	12
	,,	12. 28. 49	N.	1	Bluish-white	0·7	Fine	10	13
August	9	9. 15. 0	G.	1	Blue	0·8	. . .	7	14
	,,	10. 15. 0	H.	Jupiter	Green	4	Fine	..	15
August	10	10. 37. 3	N.	1	Bluish-white	1	Fine	16	16
	,,	10. 53. 35	N., G., S.	> 1	Bluish-white	0·8	Very fine: 4^s	..	17
	,,	10. 54. 24	N.	1	Bluish-white	0·8	Train	10	18
	,,	11. 1. 48	N.	4	Bluish-white	0·5	None	5	19
	,,	11. 12. 22	N., G.	2	Bluish-white	0·7	Fine	5	20
	,,	11. 18. 0	N.	2	Bluish-white	0·7	Train	8	21
	,,	11. 18. 40	N.	1	Bluish-white	1	Fine	15	22
	,,	11. 22. 40	G.	1	Bluish-white	4	Fine: 2^s	..	23
	,,	11. 43. 35	N.	1	Bluish-white	1	Train	15	24
August	11	10. 55. 41	N.	2	Bluish-white	0·7	Train	10	25
	,,	11. 8. 29	N.	2	Bluish-white	0·7	Train	12	26
	,,	11. 13. 19	N.	2	Bluish-white	0·4	None	4	27
	,,	11. 21. 19	N.	1	Bluish-white	0·8	Fine	10	28
	,,	11. 25. 0	N.	3	Bluish-white	0·5	. . .	8	29
	,,	11. 44. 8	N.	> 1	White	> 1	Fine	..	30
	,,	11. 56. 48	H.	3	. . .	1	. . .	..	31
	,,	11. 57. 44	N.	> 1	White	> 1	Fine	..	32
	,,	12. 0. 13	N.	2	Bluish-white	0·7	Train	8	33
	,,	12. 3. 8	N.	3	Bluish-white	0·5	Slight	5	34
	,,	12. 3. 55	N.	2	Bluish-white	0·7	Train	8	35
	,,	12. 7. 17	H.	3	White	1	. . .	..	36
	,,	12. 8. 18	N.	Jupiter	Bluish-white	> 1	Very fine	20	37
	,,	12. 19. 42	N.	2	Bluish-white	0·5	Train	5	38
	,,	12. 22. 17	H.	2	White	0·8	. . .	..	39
	,,	12. 26. 56	N.	> 1	Bluish-white	> 1	Very fine	..	40
	,,	12. 28. 5	N.	3	Bluish-white	0·5	Slight	7	41
	,,	12. 35. 2	N.	4	Bluish-white	0·5	None	8	42
	,,	12. 37. 7	H.	2	White	0·5	. . .	..	43
	,,	12. 41. 56	N.	3	Bluish-white	0·5	Train	9	44
	,,	12. 44. 31	N.	3	Bluish-white	0·5	Train	6	45
	,,	12. 45. 46	N.	3	Bluish-white	0·5	Train	4	46
	,,	12. 46. 56	H.	1	Bluish-white	2	Train	..	47
	,,	12. 47. 42	N.	2	Bluish-white	0·5	Train	8	48
	,,	12. 51. 56	H.	1	Bluish-white	2	Train	13	49
	,,	12. 54. 0	N.	1	Bluish-white	1	Fine	10	50
	,,	12. 56. 51	H.	2	White	1	. . .	..	51
	,,	13. 2. 6	H.	1	Blue	2	Train	..	52

August 8. Sky cloudy throughout.
August 10. Sky very cloudy.

August 9. Sky generally cloudy.
August 11. Sky cloudy till 10^h, when breaks appeared; cloudless from $10^h. 35^m$, but misty at times.

No. for Reference.	Path of Meteor through the Stars.
1	Appeared near β Ursæ Minoris, passed about 4° to right of Polaris.
2	From a little below β Cassiopeiæ, moved towards η Pegasi.
3	Brighter than the Moon, and seen in twilight, a very brilliant object. Moved from a point about 7° to right of and above the Moon, disappeared at a point about the same relative position to left of Moon, passing (at center of path) about 5° above the [Moon.
4	From direction of Aldebaran fell on path parallel to line joining γ and β Orionis.
5	From near α Canum Venaticorum moved in direct line towards and disappeared a short distance from δ Ursæ Majoris.
6	Passed about 7° to west of α Aquilæ, moving downwards parallel to a line joining α and θ Aquilæ.
7	From between λ and μ Herculis to a point 4° or 5° to the left of λ Serpentis. Passed exactly over α Herculis.
8	Passed between ϵ and ζ Ursæ Majoris and across α Canum Venaticorum.
9	Passed about midway between η Ursæ Majoris and γ Boötis, moved on path parallel to line joining γ Boötis and Arcturus.
10	From near θ Draconis to α Coronæ Borealis.
11	Across ζ and λ Aquilæ.
12	Passed above θ Aquilæ to η Aquilæ.
13	Passed across δ Cygni and γ Lyræ.
14	From about midway between α and β Ursæ Majoris moved directly towards α Canum Venaticorum.
15	Appeared near α Capricorni, passed behind a cloud; re-appeared, and finally disappeared a short distance from the horizon.
16	Passed from a point about 2° below Polaris to β Ursæ Minoris.
17	Passed a little above α Cassiopeiæ and moved at right angles to line joining α and β Cassiopeiæ towards λ Andromedæ.
18	Passed across α and γ Cygni.
19	Passed across α Cassiopeiæ from a point slightly below ρ Cassiopeiæ.
20	Short path about 7° to left of and parallel to line joining α and δ Persei, moving from direction of ϵ Cassiopeiæ.
21	Passed across β and η Pegasi.
22	Passed above α Delphini and across γ Aquilæ.
23	From near α Cygni passed behind clouds, and disappeared near α Aquilæ.
24	From a point near α Cephei passed across zenith, moving from direction of Perseus.
25	From direction of ϵ Cassiopeiæ passed midway between Polaris and γ Cephei.
26	Passed midway between β and γ Andromedæ towards γ Pegasi.
27	From direction of θ Cassiopeiæ passed between α and η Cassiopeiæ.
28	From δ Cassiopeiæ passed across η Cassiopeiæ.
29	Appeared about 7° above α Andromedæ and moved towards α Pegasi.
30	From direction of α Andromedæ passed between α and γ Pegasi to γ Piscium.
31	From α Cygni disappeared about 7° to left of β Cygni.
32	Moved from direction of Polaris to ζ Draconis.
33	Passed across α Andromedæ towards γ Pegasi.
34	Passed almost midway between β Ursæ Minoris and α Draconis, moving from O Camelopardali.
35	Passed 2° to left of γ Ursæ Minoris to α Draconis.
36	From β Trianguli passed between γ and α Trianguli.
37	Passed between α Lyræ and γ Draconis to α Herculis.
38	Short path near ϕ Draconis, moving from direction of τ Draconis.
39	From α Persei disappeared near δ Persei.
40	From α Cassiopeiæ passed across λ Andromedæ.
41	Passed midway between β Pegasi and α Andromedæ, moving from direction of α Pegasi.
42	Passed midway between β and γ Draconis, moving from ζ Draconis.
43	From δ Cassiopeiæ disappeared near γ Cassiopeiæ.
44	From direction of γ Cephei passed across χ Draconis.
45	From a point midway between β Cassiopeiæ and β Cephei moved to β Cephei.
46	From β Cassiopeiæ moved on line of continuation of line joining β and γ Cassiopeiæ.
47	From a point midway between γ and β Draconis disappeared near ζ Herculis.
48	Passed between β and γ Andromedæ and about 3° below β Andromedæ.
49	From ζ Draconis disappeared near β Draconis.
50	From direction of α Cephei to α Lyræ.
51	From β Pegasi disappeared near μ Pegasi.
52	From α Pegasi disappeared near α Andromedæ.

Month and Day. 1877.		Greenwich Mean Solar Time	Observer.	Apparent Size of Meteor in Star-Magnitudes	Colour of Meteor.	Duration of Meteor in Seconds of Time.	Appearance and Duration of Train.	Length of Meteor's Path in Degrees.	No. for Reference.
		h m s						°	
August	11	13. 9.10	N.	3	Bluish-white	0·5	Slight	7	1
	"	13. 9.30	H.	2	White	1	Train	..	2
	"	13.18.22	N.	1	Bluish-white	0·5	Train	5	3
	"	13.21. 0	H.	2	White	3	. . .	..	4
	"	13.23.37	N.	1	Bluish-white	0·7	Train	10	5
	"	13.29.46	N.	> 1	White	1	Fine: 2^s	9	6
	"	13.32.13	H.	2	Bluish-white	1	Train	..	7
	"	13.34.33	N.	3	Bluish-white	0·5	Slight	5	8
	"	13.37.33	H.	2	White	1	None	..	9
August	14	9.11.23	N.	1	Bluish-white	0·8	Train	15	10
	"	9.11.40	N.	1	Bluish-white	1	Train	..	11
	"	10.30.12	N.	3	Bluish-white	0·5	Slight	5	12
August	15	8.57.55	N.	2	Bluish-white	0·5	Train	15	13
	"	11. 7.	J.	2	White	0·5	None	16	14
August	23	12. 4. 0	N.	2	Bluish-white	..	Train	..	15
August	31	10.24.	J.	< Mars	Reddish	1·0	. . .	15	16
September	2	8.14.20	N.	2	Bluish-white	0·7	Train	10	17
September	5	10. 1.54	N.	2	Bluish-white	0·7	Train	..	18
October	14	9.10.15	N.	Jupiter	White	> 1	Fine train	12	19
October	29	11.31.	N.	Mars	Yellowish	1	Train	12	20
November	3	12.23.	N.	> 1	Bluish-white	0·8	Train	10	21
November	12	12. 4. 2	N.	Mars	Bluish-white	> 1	Fine	20	22
	"	12.15.23	N.	Mars	Bluish-white	1	Fine	..	23
November	13	11.27.34	N.	> 1	Bluish-white	1	Train	20	24
	"	12. 4.17	J.	1 × 3	White	1·5	Splendid: 3^s	15	25
	"	12. 8.17	J.	1	Blue	1	None	20	26
	"	12.22. 2	J.	2	White	0·8	None	..	27
	"	12.25.22	J.	1	Bluish-white	1	None	..	28
	"	12.31.17	J.	1	Blue	1	None	..	29
	"	14.18.32	J.	Sirius	Blue	1·5	Fine: 1^s	..	30
	"	14.19.57	E., J.	1	Bluish	0·5	None	12	31
	"	14.21. 2	E.	2	Yellowish	0·5	None	3	32
	"	14.49.12	E., J.	3	Reddish	0·5	None	10	33
	"	14.53.27	E., J.	1	Bluish-white	0·3	None	10	34
	"	15. 2.12	E.	1	Blue	0·3	None	10	35
November	14	10.44.45	J.	Venus	Yellowish	1·5	Faint	..	36
November	23	9.12.24	N.	> Venus	Yellowish	2	Fine	25 to 30	37
December	9	8.11. 0	J., H.	Venus × 2	Bluish-white	3	Splendid: 2^s	..	38
	"	8.39.	H.	Mars × 2	Red	..	Slight	..	39
	"	9. 9.	S.	Jupiter	Bluish	1	None	..	40
December	12	10.10.37	N.	2	Bluish-white	0·5	None	5	41
	"	11.20.	G.	2	Bluish-white	0·4	Slight	7	42
	"	11.21. 8	N.	3	White	0·7	None	8	43
	"	11.24.13	N.	1	Yellowish	0·5	Train	5	44
	"	11.36.52	N.	2	White	0·8	Train	15	45
	"	11.39.32	N.	> 1	White	..	Fine	25	46

August 12 and 13. Sky cloudy. November 12^d. 12^h. Sky covered.

November 14. A little cloud was occasionally present till 13^h; the sky then became overcast.

No. for Reference.	Path of Meteor through the Stars.
1	Moved from [illegible] a point midway between Polaris and γ Cephei and passed midway between ι and ϕ Draconis.
2	From a point [illegible] to right of Polaris disappeared near that star.
3	From [illegible] of ϵ Cassiopeiæ passed near P Camelopardali.
4	From P Camelopardali disappeared near α Ursæ Majoris.
5	Moved directly towards α Ursæ Majoris from direction of δ Ursæ Minoris.
6	Passed about [illegible] above Polaris (at center of path) moving from direction of γ Cassiopeiæ.
7	From α Aquilæ disappeared near ϵ Muscæ.
8	Appeared between [illegible] and ζ Ceti and passed about 2° to the left of the latter star.
9	From Polaris disappeared near δ Ursæ Minoris.
10	Passed between ϵ Aquilæ and α Ophiuchi and between κ Serpentis and γ Ophiuchi.
11	Passed near to ζ and δ Herculis.
12	Passed between 52 and 51 Andromedæ moving from upper part of Perseus.
13	From a point between [illegible] and κ Ophiuchi passed about 2° to right of θ Ophiuchi.
14	Passed about [illegible] above ζ Ursæ Majoris and disappeared near γ Boötis.
15	From ϵ Aurigæ passed between π and θ Aurigæ.
16	Appeared about [illegible] below Polaris and disappeared about 10° above α Ursæ Majoris.
17	From near α Lyræ passed about 5° to left of ζ Herculis.
18	Passed a little below α Andromedæ to α Pegasi.
19	From direction of Polaris passed between α and δ Ursæ Majoris towards γ Ursæ Majoris.
20	Passed midway between δ and θ Ursæ Majoris and between γ and χ Ursæ Majoris.
21	From γ Arietis to γ Pegasi.
22	Passed between α and δ Ursæ Majoris and between α Draconis and γ Ursæ Minoris.
23	Passed nearly midway between ϵ Ursæ Majoris and δ Ursæ Minoris and near α Draconis, moving towards ι Draconis.
24	Passed across δ and [illegible] Pegasi, path parallel to line joining α Andromedæ and α Pegasi.
25	Passed from direction of Castor across 38 Lyncis.
26	From Pollux to ϵ Leonis.
27	From about 10° east of δ Aurigæ to near 38 Lyncis.
28	From Pollux to near 40 Lyncis, wavy path.
29	From δ Geminorum to ζ Orionis.
30	Passed from Regulus to ι Hydræ.
31	Passed about 3° to right of λ Ursæ Majoris and moved towards α Ursæ Majoris.
32	From a point about 4° from α Ursæ Majoris in direction of Regulus, moved to ω Ursæ Majoris. Path rather curved.
33	Passed [illegible] to right of [illegible] Ursæ Majoris moving towards Regulus.
34	Passed between [illegible] and λ Ursæ Majoris, but rather nearer to λ, moved in direction of ι Leonis.
35	Passed nearly across [illegible] Ursæ Majoris, moving from direction of δ Aurigæ.
36	From [illegible] Ceti towards γ Pegasi.
37	From [illegible] Ursæ Majoris passed nearly midway between α and δ Ursæ Majoris. Line of flight nearly parallel to line joining [illegible] and δ Ursæ Majoris.
38	From [illegible] Draconis passed almost midway between α Draconis and Polaris, and disappeared a little below α Lyræ. Mr. B. Dennison also observed this meteor, and described it as "appearing about 6° [illegible] below Polaris, and disappearing about 1° to the left of and just below α Lyræ."
39	Appeared near δ Ursæ Majoris, bisecting a line joining γ and ϵ Ursæ Majoris, and passed nearly vertically downwards, inclining a little to the left.
40	From between [illegible] and ι Orionis disappeared a little to right of δ Orionis.
41	Passed across the Pleiades moving from direction of δ Tauri.
42	Appeared a little below δ Ursæ Majoris, moved directly towards and disappeared near α Canum Venaticorum.
43	Passed across γ Eridani at right angles to line joining γ and δ Eridani. Moving from direction of Aurigæ.
44	From direction of δ Orionis passed across ϵ Leporis.
45	From ι Aurigæ to ζ Persei.
46	Passed midway between α Arietis and α Ceti, moving from direction of the Pleiades and disappeared about 10° to left of Mars.

Month and Day, 1877.		Greenwich Mean Solar Time.	Observer.	Apparent Size of Meteor in Star-Magnitudes.	Colour of Meteor.	Duration of Meteor in Seconds of Time.	Appearance and Duration of Train.	Length of Meteor's Path in Degrees.	No. for Reference.
		h m s						°	
December	12	11. 44. 5	N.	3	White	0·4	None	10	1
	,,	11. 48. 39	N.	1	White	0·7	. . .	12	2
	,,	11. 54. 8	N.	2	White	0·3	None	3	3
	,,	11. 56. 46	N.	3	White	0·5	None	8	4
December	31	12. 4. 20	N.	4	Bluish-white	0·7	None	10	5

No. for Reference.	Path of Meteor through the Stars.
1	From near 44 Eridani to 12 Tauri. Path nearly horizontal. Very rapid motion.
2	From o Ceti towards β Ceti. Rapid motion.
3	From about 2° to left of ϵ Tauri to Aldebaran.
4	From between ζ and ι Aurigæ passed between δ and ϵ Persei.
5	From a point about 2° below η Ursæ Majoris to 8 Canum Venaticorum.

ROYAL OBSERVATORY, GREENWICH.

APPENDIX

TO THE

MAGNETICAL AND METEOROLOGICAL OBSERVATIONS,

1877.

MEAN TEMPERATURE OF THE AIR AT EVERY HOUR OF THE DAY, IN EACH YEAR FROM 1849 TO 1868.

It having been suggested that a table showing the Mean Temperature of the Air at every hour of the day, in each year from 1849 to 1868, would be a desirable addition to the tables contained in the "REDUCTION OF GREENWICH METEOROLOGICAL OBSERVATIONS, 1847 TO 1873," the annexed table, giving such particulars, has since been prepared. It was formed by re-arranging the numbers given in TABLES XXXVIII. TO XLIX. of the above-mentioned work, so as to bring together all the months in each individual year, and then taking the means of the monthly values at every hour of the day throughout each year. The table is analogous, for Temperature, to TABLE XIX. for the Barometer, included in the same work.

MEAN of the MEAN MONTHLY VALUES of the TEMPERATURE OF THE

Year.	Aggregate Number of Days employed.	Midnight.	1h a.m.	2h a.m.	3h a.m.	4h a.m.	5h a.m.	6h a.m.	7h a.m.	8h a.m.	9h a.m.	10h a.m.	11h a.m.
		°	°	°	°	°	°	°	°	°	°	°	°
1849	309	47·05	46·77	46·50	46·25	46·09	46·17	46·82	48·08	49·53	51·39	52·85	54·00
1850	357	46·14	45·83	45·52	45·23	45·05	45·12	45·77	46·95	48·46	50·21	51·97	53·34
1851	364	46·00	45·63	45·27	45·06	44·88	44·90	45·50	46·78	48·34	50·19	51·83	53·31
1852	339	47·17	46·89	46·55	46·36	46·24	46·28	46·76	47·92	49·39	51·36	53·20	54·58
1853	315	44·55	44·31	44·09	43·86	43·68	43·74	44·32	45·50	46·87	48·43	49·84	50·90
1854	352	45·55	45·13	44·79	44·47	44·24	44·27	44·76	45·92	47·64	49·94	51·90	53·53
1855	336	43·85	43·52	43·22	42·96	42·85	42·85	43·28	44·42	46·02	47·91	49·77	51·10
1856	346	46·03	45·72	45·38	45·00	44·82	44·83	45·34	46·56	47·93	49·88	51·55	52·81
1857	341	47·66	47·30	46·98	46·67	46·48	46·49	47·04	48·40	50·16	52·18	54·01	55·52
1858	326	45·88	45·42	45·04	44·78	44·59	44·72	45·37	46·50	48·20	50·25	52·16	53·76
1859	325	47·37	47·12	46·79	46·57	46·40	46·50	47·10	48·13	49·63	51·53	53·29	54·86
1860	331	44·69	44·42	44·14	43·97	43·78	43·88	44·31	45·34	46·57	48·15	49·67	50·91
1861	297	46·65	46·28	46·07	45·82	45·69	45·86	46·45	47·52	48·99	50·74	52·28	53·75
1862	283	46·31	46·07	45·84	45·67	45·54	45·65	46·17	47·06	48·35	49·78	51·15	52·33
1863	330	47·28	46·87	46·52	46·28	46·16	46·27	46·93	48·20	49·70	51·54	53·07	54·51
1864	347	45·45	45·05	44·73	44·40	44·20	44·23	44·80	46·01	47·70	49·54	51·27	52·93
1865	358	47·16	46·76	46·39	46·14	45·90	45·87	46·58	47·87	49·30	51·33	53·41	55·20
1866	356	47·20	46·84	46·61	46·35	46·19	46·30	46·90	48·09	49·49	51·18	52·81	54·15
1867	346	45·60	45·30	45·06	44·83	44·64	44·71	45·37	46·65	47·94	49·54	51·08	52·42
1868	360	48·08	47·62	47·28	47·02	46·79	46·93	47·68	49·34	50·96	53·02	54·94	56·50
Means	Sum 6718	46·28	45·94	45·64	45·38	45·21	45·28	45·86	47·06	48·56	50·40	52·10	53·52

mean

In the month of September 1862, the photographic records were not sufficiently complete to be used. The values given

AIR at every HOUR of the DAY, for each YEAR from 1849 to 1868.

Noon.	1h p.m.	2h p.m.	3h p.m.	4h p.m.	5h p.m.	6h p.m.	7h p.m.	8h p.m.	9h p.m.	10h p.m.	11h p.m.	Yearly Means.	Year.
°	°	°	°	°	°	°	°	°	°	°	°	°	
55·25	55·72	55·79	55·58	54·79	53·42	52·05	50·66	49·40	48·46	47·89	47·41	50·33	1849
54·42	55·00	55·25	55·02	54·23	52·99	51·52	50·12	48·83	47·86	47·16	46·63	49·53	1850
54·46	55·13	55·25	54·83	53·92	52·67	51·33	49·83	48·60	47·65	46·97	46·42	49·36	1851
55·81	56·54	56·67	56·28	55·37	53·96	52·48	50·98	49·69	48·71	48·12	47·56	50·62	1852
51·99	52·56	52·78	52·27	51·55	50·42	49·09	47·82	46·70	45·83	45·20	44·74	47·54	1853
54·84	55·63	55·88	55·54	54·42	53·05	51·51	49·87	48·48	47·40	46·64	46·10	49·23	1854
52·33	52·97	53·10	52·58	51·70	50·55	49·17	47·64	46·35	45·31	44·62	44·16	47·18	1855
54·06	54·59	54·84	54·41	53·44	52·19	50·92	49·56	48·42	47·53	47·02	46·53	49·14	1856
56·76	57·38	57·57	57·20	56·18	54·72	53·22	51·74	50·38	49·27	48·60	47·97	51·24	1857
55·09	55·78	55·94	55·51	54·43	53·03	51·62	50·13	48·82	47·73	46·89	46·28	49·50	1858
56·09	56·81	57·02	56·68	55·72	54·34	52·87	51·43	49·97	48·92	48·33	47·79	50·89	1859
52·08	52·64	52·75	52·51	51·58	50·37	49·23	47·95	46·78	45·93	45·38	44·98	47·58	1860
55·15	55·72	55·93	55·67	54·61	53·32	51·96	50·49	49·21	48·22	47·56	46·96	50·04	1861
53·51	53·92	54·07	53·83	53·08	52·11	51·05	49·73	48·66	47·77	47·17	46·67	49·23	1862
55·94	56·48	56·75	56·43	55·28	53·91	52·46	51·12	49·92	48·86	48·11	47·53	50·67	1863
54·38	54·89	55·14	54·82	53·82	52·62	51·16	49·58	48·28	47·36	46·70	46·04	48·96	1864
56·58	57·24	57·43	56·98	56·06	54·89	53·38	51·57	50·08	49·00	48·31	47·67	50·88	1865
55·20	55·82	55·85	55·50	54·67	53·72	52·37	50·86	49·54	48·58	48·02	47·43	50·40	1866
53·51	54·03	54·18	53·82	53·07	51·99	50·66	49·24	48·06	47·12	46·52	46·00	48·81	1867
57·86	58·30	58·46	58·17	57·23	56·02	54·36	52·71	51·26	50·04	49·26	48·66	52·02	1868
54·77	55·36	55·53	55·18	54·26	53·01	51·62	50·15	48·87	47·88	47·22	46·68	49·66	..

May

n the above table for the year 1862 are the means of the monthly values for the remaining eleven months of the year.